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APRIL, 1879.

NOTE ON MINIM PIPETTES.

By Edward R. Squibb, M.D., of Brooklyn.

The last number of this journal contains a paper by Mr. Chas. W. Drew upon this subject. These pipettes and the arrangement figured by Mr. Drew are by no means new or original with him, as he seems to suppose, but were in constant use in the laboratory of the writer when Mr. Drew was an assistant there, as well as in many other laboratories and by many dispensing pharmacists. As a very simple device, likely to occur to anyone in practice, they may have been long used by many, but, so far as the writer knows and believes, the simple and convenient syringe-like device for suction was adopted and recommended publicly by this writer two or three years ago. Although never figured nor published as the subject of a paper before Mr. Drew's article, it has often been shown at medical and pharmaceutical meetings, and was noticed by Prof. Jos. P. Remington at a pharmaceutical meeting of the Philadelphia College of Pharmacy in May, 1878 (see this journal for 1878, p. 314).

Neither in the 15-minim pipette figured by Mr. Drew nor in the 20-minim pipette (the next size), is the arrangement of an external tube necessary. In both these sizes the common rubber tip used with dropping-tubes generally is all that is required. This is slipped onto the top of the minim pipette, and pushed down as far as possible, or until the end of the pipette is against the bottom of the tip. Then, at the moment when the point of the pipette is to be introduced into the liquid to be measured, the rubber tip is compressed to force out as much air as possible. When this pressure is removed and the tip springs out again, the liquid will rise in the pipette to 5—8 minims. Then, by sliding the tip upward on the pipette by pushing it from below, the syringe-like suction is accomplished, whereby the pipette may be filled to any desired mark not greater than 20 or 25 minims,

according to the capacity of the tip. In the 30 and 60-minim graduated pipettes the tip is not large enough, and hence the necessity of resorting to the external tube and its section of rubber tubing, as figured by Mr. Drew. For still larger graduated pipettes, say up to four fluidrachms, a common glass penis syringe with a ring piston rod to admit the end of the forefinger, and the point armed permanently with a short section of rubber tubing, wired securely onto the syringe, but slipping on and off the upper end of the pipette rather easily, answers an excellent purpose in dispensing. With such an arrangement small quantities of liquid up to the full capacity of the pipette can be conveniently measured out of a dispensing bottle without disturbing the sediment or wetting the neck or lip of the bottle.

If suction by the mouth be used with graduated pipettes the mouth should never be applied directly to the pipette, but indirectly by a piece of glass tubing 5 or 6 inches =12·5 or 15 centimeters long, armed with a piece of rubber tubing wired onto it 2 to 3 inches =5 to 7·5 centimeters long. The free end of this rubber tubing is slipped on and off of the pipette when used. The pipette, with the auxiliary tube attached, is introduced into the liquid to be measured and held with the left hand, the free end of the auxiliary glass tube is held by the teeth, and the graduations being brought up to near the level of the eyes by the bending of the rubber part of the tube, suction is made gently till the liquid rises in the pipette a little above the required mark on the graduated scale. Then the rubber tube is pinched by the thumb and finger of the right hand close above the end of the pipette; the glass tube is dropped from the mouth, and the level of the liquid is adjusted to the desired graduation by allowing the excess drawn in, to escape back into the bottle. When the exact quantity is contained, the whole is transferred by the right hand to the bottle or vessel which is to receive the measured quantity, and the pinching of the rubber part of the tube being then relaxed, the liquid flows out.

Brooklyn, March 11th, 1879.

A SENSIBLE PRESENT TO OUR YOUNGSTERS.

By Hans M. Wilder.

The Orange Judd Co. ("American Agriculturist"), 245 Broadway, New York, have just got out a ten dollar microscope, and a splendid instrument it is for the price. This has only been made possible by manufacturing it by the thousands.

Like most of the optical instruments of the Bausch & Lomb Co., Rochester, N. Y., it has hard rubber substituted for brass wherever possible; the few parts that have to be made of brass are nickel plated, and it thus forms—black relieved by white, and of gracious design—a beautiful little instrument. Its magnifying power is about up to one hundred diameters; it has a divided objective, which—although not claimed to be achromatic—shows no more color than the ordinary run of so-called "achromatic" French objectives. Its concave mirror, besides the ordinary double motion, can be turned up over the stage and serve as condenser. This little microscope has one feature hitherto only found in fifty dollar (and higher) instruments, viz., a camera lucida of very simple construction. It is very easy to draw by means of it. It has a draw-tube, and is moved by rack (two large milled heads). Considering its low price and low magnifying power, it will probably be questioned whether it is good enough for anything but a scientific toy.

Little as it magnifies, and although its objectives are not professedly achromatic, it enables us to follow nearly all the descriptions and explanations found in our text-books. It serves to familiarize our apprentices with the handling and working of a microscope, not to mention that much time otherwise thrown away in frivolous pursuit will be spent profitably.

I think that such an instrument would be a sensible present to make to our deserving apprentices; the money cannot well be spent better.

Since beginners in microscopy are generally inclined to use too large amplifications, it will not be out of place to mention that the diameter of the field seen with a magnifying power of 25 diameters is about a quarter of an inch; with 50 diameters about one-eighth of an inch; with 100 diameters about one-sixteenth of an inch, and so on. The head of a fly, for instance, is about one-eighth of an inch broad, and will about cover the whole field of an amplification of 50 diameters.

ON SOME CALIFORNIA DRUGS.

COLUSA, March 10th, 1879.

Editor American Journal of Pharmacy:

We send you by mail samples of *Rhamnus purshiana*, *Berberis aquifolium* and *Eriodictyon californicum*, all of which are natives of California, or more properly speaking the Pacific Slope. There has been considerable stir in the last year or two about the above-named drugs, as there usually is about new remedies. The rhamnus, I believe, was first brought to the notice of the medical profession by Dr. J. H. Bundy, an eclectic physician, under the name of "Cascara Sagrada," which was given it by the early Mexican settlers of California, and means literally translated "holy bark;" it also bears the name of chittam bark, and by the latter name it is universally known through the Coast Range Mountains of the Pacific Slope. It has been used for years in domestic practice, and is considered an infallible remedy by the Mexicans for almost every complaint.

Berberis aquifolium or grape root, is a hardy plant with fruit resembling the wild grape, and flourishes extensively throughout the Coast Range and Sierra Nevada Mountains; it also is used extensively in domestic practice, especially by the American residents, for tonic and anti-malarial purposes. It has certainly proved to be excellent and without doubt it contains other properties that will render it a valuable remedy.

Eriodictyon californicum, or yerba santa, is a hardy evergreen, flourishing best in the mountains, but it is to be found in sheltered glades and ravines near the valley of the Sacramento. It grows from two to five and six feet in height and is covered with a resinous exudation that pervades every part of the stem and leaf, but more especially the leaf. It is used more extensively perhaps than any other of our domestic drugs, and has been proved to be an excellent expectorant and diaphoretic. The bush, when green, presents a striking and pleasing appearance; the leaves are of a rich dark green and have the appearance of being covered with varnish.

Grindelia robusta and *Grindelia squarrosa* also deserve mention, as they are rapidly growing in demand in the medical profession.

Grindelia robusta, or tar weed, as it is vulgarly termed, is found in abundance covering the high mountain ridges and valleys; it blooms

from July to September, either earlier or later according to the season, and is possessed of its best properties about the latter part of August.

Grindelia squarrosa differs but slightly in appearance with the Grindelia robusta; it prefers the lowlands and prairies, and grows very abundantly from July to September.

W. C. ATHERDEN.

CHEMICAL and MICROSCOPICAL ANALYSIS of the BARK of RHAMNUS PURSHIANA (CASCARA SAGRADA).[1]

BY ALBERT B. PRESCOTT, M. D.[2]

The examination embraced (1) The Structure of the Bark; and (2) The Chemical Constituents of the Bark.

(1) *The Structure of the Bark.*

I. The *corky layer* (*a*). This consists of the outer epidermis of dark brown weathered cells, then several rows of cells filled with a dark red coloring matter (*e*), and in the more recent bark, a row or two of cells containing chlorophyll. The red color (*e*) is soluble in ether, alcohol, potassium hydrate solution (with a dark brown color), insoluble in acetic acid.

II. The *middle bark* (*b*) is made up of parenchymatous cells which are filled with small starch grains. There are visible, also, in the *transverse* section, several groups of cubical crystals (*f*), and, in the *longitudinal* section, groups of very thick-walled yellow cells (*k*). These cells (*k*) are not noticeably affected by the ordinary re-agents.

III. The *inner bark* (*c*) consists principally of yellow medullary rays (*d*), separated by bast parenchyma (*g*), through which are scattered numerous yellow bast fibres (*b*). As seen in *longitudinal* section, these fibres (*b*) are frequently surrounded by small cubical crystals (*f*). The crystals (*f*) appear not to be affected by hydrochloric acid.

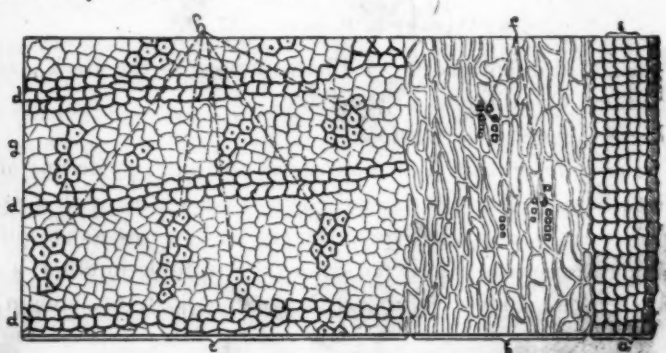
Almost the entire inner bark (III), and parts of the middle bark (II) are turned cherry-red color by contact with potassium hydrate solution.

[1] The sample of the bark examined was furnished me by Messrs. Park, Davis & Co. I have given no attention to its identity, as bark of the *Rhamnus purshiana*. However, its structure closely resembles that of rhamnus frangula bark, while having distinct differences from the latter (see Cortex Frangulæ, in Hager's "Pharmaceutische Praxis," also "Pharmacopœa Germanica").

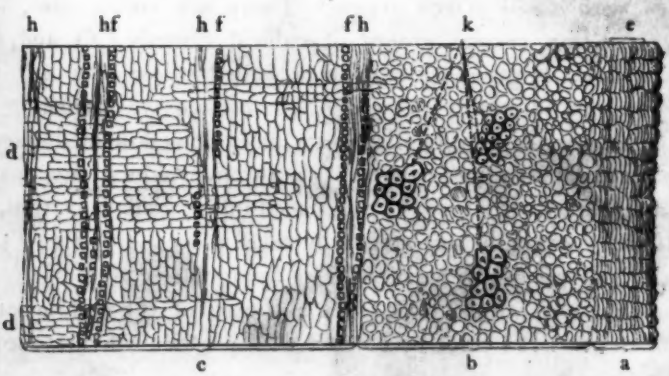
[2] Reprint from "New Preparations," communicated by the author.

(2) *The Chemical Constituents of the Bark.*

I. A Brown Resin, of strong bitter taste, colored vivid purple-red by potassium hydrate solution. This resin is contained mostly in the middle and inner layers of the bark. It is sparingly soluble in water, freely soluble in alcohol and dilute alcohol, and scarcely at all soluble in absolute ether, soluble in chloroform, in benzol (of coal tar), and in carbon disulphide; soluble in caustic alkali solution, with splendid color above mentioned, and precipitated from this solution by acids. Concentrated sulphuric acid colors it blood-red. It is removed from alcohol solution by animal charcoal.



Transverse Section.



Longitudinal Section.

II. A Red Resin, nearly tasteless, colored rich brown by potassium hydrate solution. It is insoluble in water, soluble in alcohol and dilute alcohol, not freely soluble in ether, or chloroform, or carbon disulphide; soluble in caustic alkali solution, with the brown color above mentioned,

this solution being precipitated by acids. Concentrated sulphuric acid deepens its color brownish-red. It is not removed from alcohol solution by animal charcoal. In the bark, it resides in the corky layer (*a*).

III. A LIGHT YELLOW RESIN OR NEUTRAL BODY, tasteless, colored bright red-brown by sulphuric acid, not colored by potassium hydrate solution. It is insoluble in water, soluble in hot alcohol, sparingly soluble in cold alcohol of seventy per cent., soluble in chloroform, in carbon disulphide, and to some extent in benzol (of coal tar). In the concentration of its alcohol solution, it deposits in pale orange-yellow granules. Its alcohol solution gives negative results with the general tests for alkaloids.

IV. A CRYSTALLIZABLE BODY, obtained from absolute alcohol solution, in white double pyramids and some other forms of the dimetric system. The crystals melt and then sublime, at a temperature a little above the water-bath, the sublimate being partly crystalline. This substance is not appreciably soluble in ether, chloroform or petroleum ether; is slowly soluble in absolute alcohol, slightly soluble in seventy per cent. alcohol, soluble in benzol (of coal tar). It is neutral to test papers, and is not dissolved by potassium hydrate solution, by acetic acid, or dilute sulphuric acid. It is not colored by potassium hydrate solution, concentrated sulphuric acid, nitric acid, Frœhde's reagent, or sulphuric acid followed by dichromate. The alcohol solution gives negative results with the general tests for alkaloids.[1]

V. A TANNIC ACID, giving brownish-green color, with ferric salts.

VI. OXALIC ACID.

VII. MALIC ACID.

VIII. A FAT OIL, of yellow color.

IX. A VOLATILE OIL, not abundant, bearing the characteristic odor of the bark.

X. WAX.

XI. STARCH, in abundant quantity.

[1] The crystals of this substance were repeatedly obtained as follows: The alcohol extract of the bark (previously exhausted with ether), was dissolved by water, this solution precipitated by lead acetate, the washed and drained precipitate suspended in absolute alcohol and the lead removed by hydrogen sulphide, and the nitrate then evaporated. A distinct alliaceous odor is developed after the hydrogen disappears, and the crystals in question then appear. The crystalline body may prove to be a product rather than an educt, and its production may be related to that of the allyl compound, indicated by the odor.

The proportional quantity of the resins I., II. and III., is indicated pretty nearly by the quantity of resin extract obtained as follows: An acidulated alcohol solution of the bark was neutralized (with ammonia), and evaporated, the residue dissolved in dilute potassium hydrate solution, this solution precipitated by dilute hydrochloric acid, and the precipitate drained and dried at gentle heat. (The filtrate contained some resin, I., and the precipitate retained, of course, the dissolved substances not washed out.) This crude resin extract (chiefly bodies I., II. and III.) was about ten per cent of the weight of the bark.

The substances numberered III. and IV. appear particularly to deserve farther chemical investigation, which I hope to be able to give them. The chemistry of the *rhamnaceæ* is of decided interest, especially within a few years past. *Rhamnus frangula*, the European buckthorn, or black alder, has been reported by Liebermann and Waldstein (1876) to contain EMODIN, a well-determined constituent of rhubarb, allied to chrysophane, and chemically a derivative of anthracene. Farther, the investigators just named find it nearly or quite certain that frangulin is capable of ready change to emodin, by glucosic fermentation. This may be associated with the well-known fact that the bark of *Rhamnus frangula* changes in therapeutic properties by storing. It has both emetic and purgative action in the first year after gathering, but when two year's old, retains only the purgative power—one much like rhubarb—so that some authorities positively direct that it be not used until two years after gathering. The glucosic fermentation of frangulin into frangulic acid has been known for some time, but the like formation of emodin, a constituent of rhubarb, seems a step nearer some chemical explanation of the change of medicinal power characteristic of the bark. The material worked by Liebermann and Waldstein was a large quantity of residual extract of a large quantity of frangula bark worked by the manufacturer, Merck.

The chemical constituents of *Rhamnus purshiana*, though not determined in this analysis to be, in any compound, identical with constituents of the rhamnus frangula, yet show several similar reactions, especially in the case of "Brown Resin, I." The rhamnaceæ very probably contain, in different species, allied bodies, some of them related to others as parent and product, but having practically distinct medicinal powers. These powers, of course, are known only by physiological and therapeutic trial.

University of Michigan, Feb. 5, 1879.

THE SAW PALMETTO (Sabal serrulata[1]).

By Dr. J. B. Read, Savannah, Georgia.

Botanical Description.—Stem creeping, branching; leaves circular in outline, fan-shaped, bright green, shorter than the slender plano-convex, more or less spiney-edged, petiole. The numerous (15 to 30) erect divisions slightly cleft at the apex, and without thread-like filaments in the sinuses; spadix densely tomentose, much shorter than the leaves; petals scarcely united; style slender; drupe ovoid, oblong (*S. minima*, Nuttall, *Chamærops*, Pursh.). Sandy soil in the lower districts of Florida and South Carolina. June. Stem 4° to 8° long; leaves 2° to 4° high; drupe black, 8″ to 9″ long.—*Chapman.*

History.—This plant grows abundantly in the sandy soils of the sea coast and sea islands of South Carolina, Georgia and Florida, and may, perhaps, extend into Alabama, Louisiana and Texas. The belt of territory inhabited by it stretches inland from the coast eight or ten miles. The nearer the sea, the more vigorous the luxuriance of its growth. Like most crops, its fruit is more abundant in alternate years. It is the common plant of the section of the country in which it grows, forming palmetto scrubs which extend in unbroken range for hundreds of miles, and are, from their density and the saw like edges of the leaves, almost impassable to human beings. The beach, extending from Mosquito Inlet in Florida to Jupiter Inlet, is one vast scrub, over 100 miles long and from one to three miles wide, broken only by live oak hammocks along the creeks and inlets. The cutting of roads through these palmetto scrubs is not one of the least of the labors new settlers have to undergo.

In addition to the description of the plant above given, we may add that it has large fibrous roots extending for several feet from the stem, which, being half exposed above the sand, render traveling in spring vehicles almost an impossibility.

The saw palmetto is of great use to the inhabitants. With the leaves they form a substantial thatch for their houses, and hunters can readily make from it convenient huts that last for years. The leaves are also collected, dried, put up in bales and sold for paper stock. The tough, fibrous roots, resembling in texture the husk of the cocoanut, are easily formed into scrubbing brushes. These roots contain a large

[1] Sabal levistona? *Feay.*

amount of potash salts, and may be in time a source of that valuable alkali.

The saw palmetto berries, or more properly drupes, ripen in October and November, and may be found until the middle of December. They are about the size of the olive, dark purple in color, and contain a large quantity of juice and a pit, shaped like that of the olive. The berries are at first exceedingly sweet to the taste, but in a few seconds this is followed by an acrid, pungent sensation that spreads to the fauces, nasal mucous membrane and larynx. This is in turn succeeded by a feeling of smoothness in all those parts, as if they had been coated with oil. The general impression is that of a sweet and decidedly strong, though not unpleasant butyraceous taste, which increases with the age of the fruit. The seeds are enveloped in a tough, fibrous membrane, are very hard, and, when cut open, present a white, oily, glistening substance, which burns readily with a blue flame, and gives off the odor of roasted coffee.

The oil, or rather oils—for there are two—a volatile oil, soluble in alcohol, and a fixed oil, are obtained from the expressed juice by allowing it to stand for some time. In a few days the oils rise to the surface, and the liquid is resolved into three layers; first, a yellow volatile oil, next a thicker, grayish-brown fixed oil, and then a yellowish watery fluid containing a large percentage of saccharine matter, richer in fact than cane juice itself. By evaporation this fluid yields a rich golden syrup, which neither ferments nor candies, slightly retaining the peculiar taste of the fruit. When the berries are boiled in water, the volatile oil is dissipated, filling the atmosphere for a great distance with its pungent vapor, and producing dizziness and headache in those in the immediate neighborhood.

The residue of seeds and husks, when ground up, forms an oil cake which is greedily eaten by many animals, and fattens more speedily than that of rape or flaxseed.

Medical Uses.—From the above account of some of the properties of this plant, its application as a remedial agent seems warranted. In all cases where a highly nutritive agent is needed, it seems to apply well and to fulfill the indications. By its peculiar soothing power on the mucous membrane it induces sleep, relieves the most troublesome coughs, promotes expectoration, improves digestion, and increases fat, flesh and strength. Its sedative and diuretic properties are remarkable.

It has been used with benefit in cardiac asthma, phthisis (especially laryngeal phthisis), chronic bronchitis and dilation of the bronchial tubes. Its action in catarrhal affections is rapid and permanent. A cold in the head may be abated by two or three doses. Mixed in boiling water, and used by inhalation, it has been found very beneficial in chronic ozena.

Considering the great and diversified power of the saw palmetto as a therapeutic agent, it seems strange that it should have so long escaped the notice of the medical profession. Several years ago, while on a hunting trip in the wilds of Florida, my attention was drawn to the great fattening properties of the berries, and the peculiar quality of the fat of the animals that feed on them. Most animals in the palmetto region are very fond of the fruit. During the summer months in these parts the supply of food is scanty for such animals as bears, racoons, opossums and hogs, and they have to work hard to eke out a living from roots and such animal food as they can find on the sea coast—as turtle eggs and dead fish—and they consequenrly become very thin. As soon, however, as the palmetto berries begin to ripen, they improve rapidly, and in a few weeks have acquired an enormous quantity of fat, so as to become so unwieldly that they are an easy prey to the hunter. This fat, like that of mast eating animals, consists principally of olein, and will not make lard. The berries, when dropped into water, are seized and eaten with avidity by the fishes. Even the natives frequently acquire a taste for the berries and eat them freely.

ON SOME CONSTITUENTS OF THE RHIZOME OF SANGUINARIA.

By Fred. W. Carpenter, Ph.G.

(*From a thesis presented to the Philadelphia College of Pharmacy.*)

The rhizome, in moderately fine powder, was exhausted in a percolator with water acidulated with acetic acid. The percolate was evaporated to a convenient bulk, and ammonia added until a precipitate ceased to form. This precipitate, of a purple color, was separated from the mother-liquor by a filter, and thoroughly washed with water. The filtrate (*a*) was of a dark brown color, having lost the deep red color of the infusion. The precipitate (*b*) was then dried, and macerated with successive portions of ether, until no residue was left on

evaporation of a small quantity of the solution. The solution thus obtained was a light yellowish-red color, exhibiting a very handsome fluorescence. Concentrated muriatic acid was then heated, and the gas thus given off was passed into the etherial solution by means of a glass tube, until it was saturated, when a voluminous scarlet precipitate of muriate of sanguinarina was formed. By this means all of the alkaloid was precipitated, its salts being wholly insoluble in ether, leaving the ether almost colorless, the slight color present being due to a small quantity of resin held in solution. The muriate of sanguinarina was purified by dissolving in hot water, filtering, precipitating by ammonia, drying the precipitate, and dissolving in ether. This solution, treated with animal charcoal, and then with hydrochloric acid gas, as before, gave the muriate pure. The precipitate (*b*) after having been exhausted with ether was dried and treated with the alcohol; a deep red tincture was obtained. This diluted with water, a resinous matter was thrown down; the mother-liquor, containing a small quantity of sanguinarina not removed by the ether of first treatment, was precipitated by Mayer's test. The filtrate (*a*) was then neutralized by acetic acid, and a strong solution of tannic acid added as long as any precipitate was formed; this was separated by a filter, and washed until the washings were tasteless, then thoroughly dried, and digested with an alcoholic solution of hydrate of potassium as long as anything was dissolved. The tannate of potash thus formed separated as a dark brown mass, it being insoluble in alcohol, which held the alkaloid in solution, together with an excess of hydrate of potash. This excess was removed by passing carbon dioxide into the solution, forming carbonate of potash, insoluble in alcohol. The solution was then decanted from any insoluble matter, and the spirit removed by distillation. The residue was then dissolved in ether, from which the so-called "Porphyroxin" separated, on evaporation, as a dirty, white, crystalline mass. By solution in alcohol, and treatment with animal charcoal, it was obtained on concentrating the solution, in minute, nearly colorless, tabular crystals, of a bitter taste, and very sparingly soluble in water, more readily so in alcohol. It is wholly dissipated by heat, giving off a peculiar odor when burning, and possessing an alkaline reaction. It neutralizes acids, forming with them salts, the hydrochlorate being in the form of cauliflower-like masses, owing to the arrangement of the crystals. But a few grains of this alkaloid were obtained from a pound of root. It

seems to differ decidedly from the porphyroxin of Merck, from opium, and is not colored by nitric acid; is dissolved by dilute acids, but does not become red on boiling. Both the supposed alkaloid and its salts give a deep blue or purple color with concentrated sulphuric acid, very much intensified by the addition of a small piece of bichromate of potassium.

In a second experiment the root was percolated and the sanguinarina precipitated as before; the alkaloid separated and the filtrate neutralized by hydrochloric acid until a slight acid reaction was obtained. A solution of iodo-hydrargyrate of potassium was added as long as a precipitate was formed; this was separated from the dark brown filtrate (*x*), washed and dried. It was then digested in a strong solution of carbonate of sodium, to decompose, and evaporated to dryness. The residue was treated with hot stronger alcohol as long as it removed anything. This gave a deep red tincture, which was acidulated with hydrochloric acid and an equal bulk of water added; this threw down a yellow precipitate, which was separated from the liquid (*a*). The precipitate was insoluble in water and petroleum benzin, partly soluble in ether, chloroform and the caustic alkalies. It fused at a gentle heat; at a higher temperature it burned, leaving no residue, and giving off the peculiar odor noticed in burning the so-called porphyroxin. It was wholly uncrystallizable, decomposed by concentrated nitric, and not changed by muriatic acid. With sulphuric acid, concentrated, it gave the same beautiful deep purple color noticed above; and, like it, deepened by chromic acid, gradually fading, and finally disappearing. It was separated into two portions by ether, the insoluble portion of a grey brown color, the etherial solution of a light yellow color in transmitted light and red in reflected light. This solution evaporated left a yellow colored residue, of a resinous nature, which gave the purple color reaction, as did also the insoluble portion, the two differing slightly in the shades of color produced. On treating the original resin with chloroform, the results were almost identical with those obtained by ether in regard to solubility and reactions. The portion insoluble in chloroform was dissolved in a small quantity of alcohol, and hydrate of potassium added; this produced the separation of a yellowish-white precipitate. A crystal of bicarbonate of potassium was added to convert the hydrate into carbonate, insoluble in alcohol. The whole was then shaken with ether, the ether removed and evapo-

rated, leaving a white crystalline residue corresponding to the supposed porphyroxin of the former experiment, and was probably carried down with the resin.

The filtrate (*a*) contained a small quantity of the supposed alkaloid, which was precipitated by Mayer's test. The filtrate was found to be free from tartaric acid, but to contain both citric and malic acids. A portion of the powder, previously exhausted with water, acidulated with acetic acid, was then percolated with alcohol, a deep red tincture being obtained. This produced a bright red precipitate with solution of protochloride of tin. A portion evaporated to dryness and treated with water gave a red solution, precipitated by ammonia and Mayer's test, the precipitate being sanguinarina. The residue was a reddish-brown resin, soluble in chloroform and ether, giving no characteristic reaction with the mineral acids.

THE RESIN AND GUM OF GAMBOGE.

By David Costelo, Ph.G.

(*From a thesis presented to the Philadelphia College of Pharmacy.*)

Gamboge consists of resin and gum, in variable proportions. The amount of resin represents its value both medicinally and as a pigment. Thinking it would be of interest to ascertain the value of the present commercial varieties, specimens of pipe, lump and powdered gamboge were procured.

Ten grams of each were treated with alcohol until the color was entirely removed. The gum, which is insoluble in alcohol, was dissolved in cold water and the solution filtered, to remove insoluble matter. The results are given in the following:

In 10 grams of	Resin.	Gum.	Impurities.	Total.
Lump,	6·76 grams.	2·74 grams.	·38 gram.	9·88 grams.
Pipe,	7·93	1·945	·015	9·89
Powder,	7·66	2·25	·07	9·98

As there is a small quantity of water contained in gamboge, the discrepancy, in the above total, is attributed to this cause.

The resin was found to be of a bright reddish-brown color, translucent, very brittle, and easily rubbed into a bright yellow powder. This is the so-called gambogic acid, $C_{29}H_{23}O_4$. Its solution in alcohol or ether has an acid reaction to test paper, and it unites with bases to form salts.

It is soluble in alcohol, ether, chloroform, bisulphide of carbon, solutions of ammonia and potassa, and partially soluble in petroleum benzin. To form the salts of this acid the experiments of Johnston and Büchner were followed, with slight modifications.

The resin dissolves very readily in warm ammonia water, forming a dark red solution of gambogiate of ammonium. The potassium salt is made by dissolving the resin in solution of potassa, the solution being also dark reddish-brown. On standing for some time, a gelatinous deposit is formed in each of the above solutions. The ammonia doposit was exposed until dry; the residue left was hard and brittle, insoluble in water, soluble in alcohol and ether, and in appearance resembles the resin.

To form the sodium salt, a portion of the ammonia solution was treated with a solution of chloride of sodium, when a yellow precipitate was thrown down. When the solutions are heated before mixing, the precipitate is much more dense.

Another portion of the ammonia solution was treated with a solution of chloride of barium, when a dark brick-red precipitate of gambogiate of barium was thrown down. The calcium salt is formed by using a solution of chloride of calcium as the precipitant; the precipitate is of a brownish-yellow color. Both these salts are soluble in alcohol and ether; on the evaporation of the solutions the salts are left in the form of a fine powder.

The lead salt was made in a like manner by precipitating with solutions of neutral and basic acetate of lead; with the former the precipitate is yellow, while with the latter it is of an orange-yellow color. These are also soluble in alcohol and ether, and are likewise left in the form of fine powder on evaporation of the solution.

When to an alcoholic solution of the resin an alcoholic solution of nitrate of silver is added, no precipitate is formed until after the addition of a small amount of ammonia, when the gambogiate of silver is thrown down as a yellow precipitate; on exposure to the air this precipitate changes very rapidly, becoming of a dark blackish-green color.

The gambogic acid also forms salts with copper, iron, strontium, etc., by precipitating its solution with a solution of a salt of these metals.

The resin was boiled with strong nitric acid until red fumes ceased to be given off, and the solution became of a thick syrupy consistence;

on cooling it solidified. This mass was washed with water to remove any free nitric acid; portions of it were then dissolved in alcohol, ether and chloroform, and on the evaporation of the solutions it was left as a light yellow colored powder.

The aqueous solution of the *gum* was boiled with nitric acid, evaporated to dryness, redissolved in distilled water and concentrated. On standing for some time small crystals were deposited, together with an amorphous reddish-brown coloring matter. The mother-liquor was drained off and the coloring matter dissolved out with alcohol, leaving the crystals colorless and transparent. As the number obtained was quite small, no satisfactory results could be obtained, other than that they were very soluble in water, insoluble in alcohol, were not entirely volatilized when heated on platinum foil, and had an acid reaction to test paper. The coloring matter, on the evaporation of the alcohol, was of a drab color, quite bitter, sparingly soluble in water, but quite soluble in alcohol and ether.

ABIETENE, A NEW HYDROCARBON, AS TYPE OF A NEW GROUP OF TERPENES.

By Samuel P. Sadtler, Ph.D.

In the number of this journal for March, 1872, Prof. William Wenzell, of the California College of Pharmacy, described a new variety of oil of turpentine, under the name of *abietene*. The material which formed the subject of his investigation was obtained from the *Pinus sabiniana*, Dougl., a tree inhabiting the dry sides of the foot-hills of the Sierra Nevada Mountains and the Coast Range, known more familiarly, however, by the name of the nut pine or Digger pine. Several months ago, I was handed by a friend a small quantity (less than a pint) of an oil of turpentine obtained in San Francisco, and said to be derived from the *Pinus ponderosa*, or heavy pine. This species belongs to the class of yellow or pitch-pines, in which is found the familiar *Pinus australis* of the Southern States, the source of our common English oil of turpentine, containing as its distinctive constituent the hydrocarbon *australene*.

A few tests sufficed to show, however, that the oil I had in hand answered more nearly to the characters of Wenzell's abietene than to the ordinary oil of turpentine, so that, if really obtained from the

Pinus ponderosa, it argued a uniformity in the chemical characters of the products of the Sierra Nevada pines.

The physical and chemical characters of abietene, as described by Wenzell (*loc. cit.*), which are especially at variance with those of common oil of turpentine, are the following: a strong penetrating odor, bearing some resemblance to oil of oranges; a specific gravity of 0·694 at a temperature of 16·5°C.; a boiling-point of 101°C.; its very volatile and inflammable character, burning with a brilliant white smokeless flame; the inability of hydrochloric acid gas to combine with it to form a hydrochlorate; and, lastly, the slight effect of nitric acid upon the oil.

Although the quantity of oil at my disposal was very small, I was enabled to repeat with the specimen I had most of the tests regarded by Wenzell as characteristic of abietene, besides making some others with a view of a more detailed chemical comparison with ordinary oil of turpentine.

The odor was very pleasant and refreshing, suggesting, as said, oil of oranges. The boiling point of the whole sample examined did not vary from 101° to 103°C., while, as is known, the several common varieties of turpentine boil uniformly at 156° to 161°C., and other members of the terpene group at 174° to 176°. The specific gravity was found, as the mean of two very careful determinations, to be ·6974 at 16·5°C., while the specific gravity of all naturally occurring terpenes is ·84 to ·86.

On examination in a Wild's polaristrobometer, it was found to be optically active, rotating the plane of polarization slightly to the left. It was to be expected that, in this respect, it would differ as the several ordinary varieties of turpentine differ from each other in this particular. Thus the optical rotatory power of English oil of turpentine (australene) is +18·6°, of French oil (terebenthene) —35·40, of Venetian oil —5·2, of templin oil —76·9°. The sample of abietene examined showed —1·58°.

Action of Hydrochloric Acid.—A portion of the oil was chilled by surrounding it with a freezing mixture, while a current of HCl was passed through it for some hours. A small quantity of a dark oil separated out in the bottom of the flask. Having removed this by means of a separatory funnel, the turpentine oil was submitted to distillation. Most of it came over under 105°C., and was, apparently,

unaltered abietene, showing only a trifling opalescence when tested with silver nitrate, after previous addition of a little nitric acid, while a small quantity of a brownish oil remained which did not distill over at 160°. While this was probably the same as the oil which separated out at first, it was put to one side, and the latter was examined for itself. After standing it in contact with precipitated calcium carbonate for a short time, to free it from any adhering HCl, it was filtered and prepared for analysis. A combustion was first made: ·2495 gram substance gave ·2261 gram H_2O, corresponding to 10·07 per cent. H., and ·6118 gram CO_2, corresponding to 66·88 per cent. C.

A chlorine determination was next made, decomposing the oil by heating with nitric acid, diluting, and, after filtration, adding silver nitrate. It was found, however, that, unfortunately, the nitric acid had not effected a complete decomposition, and so the determination was lost. Too little then remained for a chlorine determination by a combustion with quick-lime or soda-lime, which would certainly have been effectual in decomposing the chlorhydrate.

The carbon and hydrogen percentages only remained for comparison. Now the formula $C_{10}H_{16}.HCl$ requires C = 69·56 and H = 9·85, and the formula $C_{10}H_{16}.2(HCl)$ requires C = 57·41 and H = 8·61. The found results, C = 66·88 and H = 10·07, render it probable, therefore, that the oil in hand was a mono-chlorhydrate of the abietene. Still, a careful analysis of larger amounts of this oil is needed before its composition can be asserted with certainty.

Formation of a Hydrate.—Common turpentine oil left in contact with water forms a crystallized hydrate, $C_{10}H_{16}.3H_2O$. It is best obtained by mixing 8 parts turpentine oil, 2 parts nitric acid of specific gravity 1·25, and 1 part alcohol, and, after thorough agitation for some hours, allowing the mixture to stand exposed to the air in shallow vessels. This procedure was carried out with abietene, but with purely negative results. It does not form any crystallized or well-defined hydrate. After a week's standing, all that remained was a few drops of a dark-brown resinous substance, which was too small in amount to investigate.

Action of Sulphuric Acid upon Abietene.—Wenzell had stated that concentrated sulphuric acid was absolutely without action upon abietene. However, turpentine oil, when repeatedly distilled with a small amount of strong sulphuric acid, is converted into two distinct varieties, terebene, $C_{10}H_{16}$, and a polymer, colophene, $C_{20}H_{32}$, both optically inactive.

I stood a small quantity of the abietene in contact with $\frac{1}{20}$th of its bulk of strong sulphuric acid, and after 24 hours, pouring it off from the dark brown resinous sediment which had formed, distilled the oil. It boiled as before at 101°. It was again placed in contact with sulphuric acid, when a slight shade of brown only appeared to settle out, and then re-distilled. It came over at 101°. The quantities thus obtained, both of the oil distilling at 101° and of the brown resinous substance, were too small to examine in detail. It seems probable, however, that they would be found to correspond to the terebene and colophene obtained from ordinary oil of turpentine.

Action of Nitrosyl Chloride (NOCl).—This reageant has only recently been applied to the study of organic compounds. Tilden, who has given most study to the subject ("Berichte der Chem. Ges.," vii, pp. 597, 1025, and x, p. 908), finds that the compounds produced by its action upon the different terpenes are especially characteristic and stable compounds. Indeed, they seem to be so distinctive that Tilden, as quoted by Attfield ("Attfield's Chem.," 8th edition, p. 461), classifies the terpenes in part on the basis of the nitroso-compounds obtained from them. I therefore tried the action of nitrosyl-chloride, prepared by the action of common salt, upon nitrosyl-sulphate (lead-chamber crystals), upon abietene. The oil was cooled by a freezing mixture, and the gas allowed to bubble through it for several hours. A small amount of a flocculent precipitate formed, from which the oil was decanted, and the precipitate was then washed with alcohol and heated with alcoholic solution of caustic soda, in order to convert the nitrosyl-chloride compound of the terpene, which is unstable, into the more stable nitroso-terpene. A white substance was thus obtained, which should have been the sought-for nitroso-compound. It was on examination, however, found to be largely chloride of sodium, which formed on the treatment with alcoholic soda solution, and which was, of course, insoluble. How much of the desired nitroso-compound was present in it could not be readily ascertained with the small amount in hand. So the question of the nitroso-compounds I will have to leave unsettled until larger amounts of the abietene can be examined.

Tilden's classification of the terpenes (all essential oils of the composition $C_{10}H_{16}$ or isomeric with them) is the following:

"A *turpentine* group of true terpenes ($C_{10}H_{16}$) whose members boil

at 156°C. to 160°C. yield a nitroso-derivative melting at 129°C., and form a solid crystalline hydrous terpene ($C_{10}H_{20}O_2 H_2O$); and an *orange* group ($C_{15}H_{24}$), polymerides of the true terpenes, whose members boil at 174°C. to 176°C., yield a nitroso-derivative melting at 71°C., and form no solid hydrous compound."

Abietene certainly cannot be ranked in either of these classes. Its boiling point and its specific gravity alone show it to be distinct and probably in the two additional particulars regarded by Tilden as characteristic it will be found to differ. I hope to obtain shortly larger amounts of this interesting compound, when I will endeavor to settle these points definitely. At present it appears to be a type of a new group of terpenes.

In conclusion, it gives me pleasure to acknowledge my obligations to Miss Anna L. Flanigen, who carried out in the laboratory of the University of Pennsylvania the analytical work, and assisted in several of the tests made in this short investigation.

ON SULPHOCARBONATE OF POTASSIUM.

By John M. Maisch.

Several years ago a solution of sulphocarbonate of potassium was recommended in France for the destruction of the *phylloxera*, which committed serious ravages among the grape vines of Southern France and other European countries. (See "Am. Jour. Phar.," 1875, p. 327.) Since then the same compound has also been used for destroying the insects which infest ornamental plants and flowers, and even a certain value as a fertilizer has been claimed for it. It seems to be attracting some attention now in North America, and it will doubtless be of interest to the readers of the "Journal" to become acquainted with the mode of preparation and the properties of this and allied compounds, particularly since they appear to be adapted as remedies for certain skin diseases.

The sulphocarbonates were discovered by Berzelius more than fifty years ago, and the results of his investigations remain undisturbed even at the present time. The name *sulphocarbonate* indicates that these compounds have the same chemical composition as the corresponding carbonates, except that the oxygen of the latter is completely replaced

by an equal number of atoms of sulphur; the formula for sulphocarbonate of potassium is therefore K_2CS_3.

On passing carbonic acid gas into an aqueous or alcoholic solution of potassa, carbonate and finally bicarbonate of potassium is formed. A precisely analogous reaction is obtained if an aqueous solution of monosulphide of potassium is acted upon by carbon bisulphide; $K_2S + CS_2$ yields K_2CS_3. Carbon bisulphide is insoluble in water, and its solubility in this menstruum is not materially increased by the presence of a polysulphuret or of the officinal sulphuret of potassium. The preparation of sulphocarbonate involves, therefore, the previous formation of *potassium monosulphide*, and this is most conveniently obtained by passing sulphuretted hydrogen gas into a solution of caustic potassa as long as the gas is absorbed, and afterwards adding an equal bulk of the same alkaline solution. In its purest state it yields on evaporation colorless prisms of the hydrated sulphide, which are deliquescent on exposure, dissolve readily in alcohol and water, and in contact with the air become oxidized. The solution in water obtained in the manner indicated is, therefore, best preserved in well filled bottles, or it is at once agitated with carbon bisulphide, as long as the latter is dissolved. The combination is effected in a stoppered bottle at a temperature of 30°C. (86°F.); as the carbon bisulphide dissolves, the liquid acquires a yellow, brown-yellow or red-brown color, according to the concentration and purity of the solution. On careful evaporation at the temperature indicated and subsequent cooling, yellow crystals of the hydrate are obtained, which at a somewhat higher temperature part with their water and leave the anhydrous compound. *Potassium sulphocarbonate* is very deliquescent, freely soluble in water, sparingly soluble in alcohol, and has a cooling, afterwards pungent and peppery, and finally somewhat sulphurous taste.

The sparing solubility in alcohol of potassium sulphocarbonate, and the free solubility in the same liquid of potassium monosulphide, suggests the preparation of the former from an alcoholic solution of the latter. On adding to such a *concentrated* solution carbon bisulphide as long as this is taken up, the liquid will gradually separate into two or three layers, the lowest of which is a syrupy solution of the compound desired. But for the purposes for which potassium sulphocarbonate is employed, it is obtained sufficiently pure by the process described before.

If a *watery* solution of caustic potassa is agitated with carbon bisulphide, the latter is gradually dissolved, yielding a brown liquid, which contains both carbonate and sulphocarbonate of potassium in solution; $6KHO+3CS_2$ yields $K_2CO_3+2K_2CS_3+3H_2O$. Both newly formed compounds have a similar behavior to water and alcohol, and therefore cannot be separated either by crystallization or by precipitation with alcohol, and since the application of strong solutions of alkaline carbonates is inadmissable, the process described cannot be advantageously used for the preparation of potassium sulphocarbonate. Such a solution will effervesce briskly on the addition of diluted hydrochloric or sulphuric acid, and after the neutralization of the liquid the further addition of acid will render the mixture milky from the separation of *sulphocarbonic acid*, H_2CS_3, which gradually forms a heavy red-brown oil, capable of decomposing the carbonates with the evolution of carbonic acid gas.

On treating an *alcoholic* solution of caustic potassa with carbon bisulphide, the reaction is very different from the preceding, and results in the production of *sulphcarbovinate* of potassium; $KHO+C_2H_6O+CS_2$ yields $KC_2H_5OCS_2+H_2O$. This salt gives with a solution of sulphate of copper a yellow precipitate, and the acid contained in it has also been known as *xanthonic*, *xanthic* and *xanthogenic acid*; it was discovered by Zeise in 1822.

By substituting in the above processes caustic soda or lime for the potassa, corresponding sodium and calcium compounds are obtained. The soluble sulphocarbonates yield brown precipitates with salts of copper, red ones with salts of lead, and yellow ones with mercuric, cadmium and silver salts. Many of these compounds with the heavy metals are gradually turned black.

According to Delachanal (1877) the solutions of potassium sulphocarbonates of

Degrees Baumé	10	20	30	40	50
have the the density	1·075	1·161	1·262	1·383	1·530
and contain per cent. K_2CS_3	10·7	22·	35·	48·9	63·7
" " " CS_2	4·37	8·98	14·28	19·95	25·99

SALICYLIC ACID.—A CORRECTION.

By J. U. Lloyd.

Sometime ago, an article in this journal (1875, p. 343) mentioned that in preparing salicylic acid from wintergreen oil on oily liquid separated, and must be eliminated. This oily substance is *wanting* in cases where the wintergreen oil is pure; therefore, it is with pleasure I offer this criticism of a formula otherwise effective. The article alluded to was written by myself, and for some two years I have been expecting to note the above-mentioned correction from the pen of another. It is time that some one should speak, therefore I will state that the remarks alluded to were based upon insufficient data. I will also say that at present pure wintergreen oil can easily be obtained.

Note.—Oil of wintergreen is a mixture of two oils, one of which, a hydrocarbon, boiling near 200°C., is present in small quantity only. About 90 per cent. of the oil consists of methyl-salicylic acid, which, with potassa, yields salicylate of potassium and methylic alcohol. Oil of wintergreen is not unfrequently adulterated with oil of sassafras, which admixture is readily detected by cold nitric acid.—Ed. Am. Jour. Phar.

TULLY'S POWDER.

Elmira, N. Y., March 19, 1879.

Editor of the American Journal of Pharmacy:

Dear Sir—I enclose formulæ of "Tully's Powder," with the authority for each. Your readers may already be familiar with the several recipes. It shows how uncertain a prescription is if ordered by its popular name.

Formula of Dr. H. M. Field, Prof. of Therapeutics, Dartmouth Medical College.

(1) ℞ Pulv. camphoræ, . . . ·12
" glycyrrhizæ, . . . ·50
Morphiæ sulphatis, . . . ·015—·007
M.

Formula of Dr. C. P. Frost, Prof. of Theory and Practice of Medicine, Dartmouth Medical College.[1]

(2) ℞ Cretæ preparatæ (Eng), . . .
Pulv. camphoræ, . . .
" glycyrrhizæ, . . . *aa* ·32
Morphiæ sulphatis, . . . ·015
M.

The above is also as prepared by T. Metcalf & Co., Boston.

[1] This is nearly identical with the formula of the Mass. Med. Society.—Editor.

From New Remedies, April 1, 1875, page 192.[1]

(3) ℞ Pulv. opii, ... ·06
" glycyrrhizæ rad., . . .
" camphoræ, ...
" cretæ preparatæ, . . ää ·20
M.

From Mann's Prescription Writing, P. Putnam's Sons.

(4) ℞ Morphiæ sulphatis, . . . ·06
Camphoræ, ...
Pulv. glycyrrhizæ, . . .
Cretæ preparatæ, . . . ää ·65
M.

The Pharmacist, pp. 156, for 1873.[2]

(5) ℞ Morphiæ sulphatis, ...01
Camphoræ, ... ·28
Calcis carbonatis precip., . . . ·21
Pulv. glycyrrhizæ rad., . . ·10
M.

We have five different recipes, each claiming to be Tully's Powder, and each emanating from a reliable source.

C. W. M. Brown, M.D.

A NEW METHOD OF MAKING SUPPOSITORIES.

By E. T. Ellis.

In this progressive age, when the requirements of the medical profession demand the greatest amount of exactness, nicety and expedition on the part of the dispensing chemist, we notice that Mr. H. C. Archibald, pharmacist, No. 4099 Lancaster avenue, Philadelphia, has come to the relief of the latter by the invention of a machine which will (and ought to) revolutionize the present tedious, and to some extent inaccurate way of preparing *suppositories*, and be hailed with delight by those who are required to furnish them almost daily. The following cut represents his Patent Compressed Suppository Mould for making the various sizes without heat.

Figure 1 represents the machine complete, reduced to one-fourth the size; letter *A* the hopper, in which is thrown the mixture of cacao butter with active ingredient; *B* the plunger, used for compressing the

[1] Dr. L. Barlow writes to "New Remedies" that Tully's formula, as published in his Materia Medica, directs powdered opium, 1 part; powdered camphor, powdered liquorice root and precipitated carbonate of calcium, of each 3 parts Morphia may be substituted for the opium if preferred.—Editor Amer. Jour. Phar.

[2] The "Pharmacist" gives the formula in parts, thus: Sulphate of morphia, 1 part; powdered camphor, 28 parts; precipitated carbonate of calcium, 21 parts, and powdered liquorice root, 10 parts.—Editor

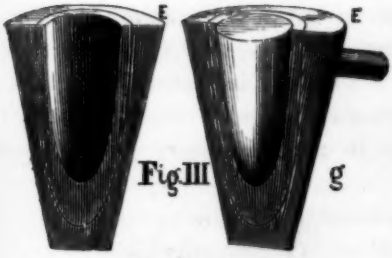
suppositories; *C* the hand-lever; *D* the swing-bed, for holding the mould; *E* the mould, split longitudinally; *G* the suppository in one-half of mould after compression; *H* the manner of discharging the moulded suppository; *I* the cut-off.

Fig. I.

Suppository Machine.

Fig. II.

Swinging bed, open, with mould.



Mould, cut longitudinally.

Fig IV

Manner of discharging suppository.

By the above simple apparatus an expert hand can readily make 8 to 10 suppositories per minute, and of a finish that cannot be obtained by moulding. The above machine has different sets of moulds for different sizes of suppositories, and the method of working it is as follows: First. Keep your cacao butter in a grated condition in a cool place, which can be accomplished readily by using the ordinary lemon grater

(the writer has grated one pound in three or four minutes). When that is accomplished, and the grated cacao is safely on the shelf, the pharmacist need have no horror of making suppositories. If twelve 15-grain suppositories were ordered, containing 1 grain of pulv. opii each, all the pharmacist has to do is to weigh about 168 grains of grated cacao butter and 12 grains of powdered opium. Mix with a spatula on a piece of paper or pill tile, so that the whole will be thoroughly incorporated, and throw the mixture in the hopper (letter *A*), and by simply operating the lever to compress the mixture, a perfect moulded suppository is made, which is cut off when the mould is swung around, so that no variation in the size of the suppository can result. The same process can be observed in the making of almost all suppositories, such as morphia, tannin, carb. lead, quinia, ext. krameria, etc. When aqueous extract of opium is ordered, it will be necessaey to keep on hand the extract in a dry state, so as to admit of its ready pulverization, which can readily be done without detriment to the extract; besides, it is not hygroscopic. The same will apply, also, to the other alcoholic extracts, hyoscyamus, belladonna, stramonium, aconite, aloes and rhubarb, all of which can be dried and kept in stock by the pharmacist.

The advantages this machine has over the common way of preparing suppositories by fusion of the cacao butter and incorporation of the medicinal agents, are many; but when calomel, preparations of lead and articles of very different specific gravities are ordered, in the old way it is impracticable to keep them equally diffused throughout, and defeating the object in view—slow elimination and absorption of the active ingredients. They can be summed up: First. Accuracy, the most important; perfect and uniform results are obtainable. Second. Attractive appearance of the suppository, presenting an elegant finish. Third. Facility of preparation and dispensing; a prescription of a dozen can be ready in less time than as many pills or powders. Fourth. Cleanliness; the mould requires no cleaning.

It is believed that the machine can be furnished as low as six dollars, thus placing it in the reach of all.

CHEMICAL NOTES.

By Prof. S. P. Sadtler.

Inorganic Chemistry.—The beautiful experiments of Messrs. Cailletet and Pictet on the liquefaction of the so-called permanent gases (this journal, p. 185, 1878) are already bearing fruits in inciting others to similar work. M. Ogier has just accomplished the liquefaction of *hydrogen silicide* (H_4Si). This was done with the Cailletet apparatus. At ordinary temperatures (about 10°C.) hydrogen silicide is not liquefied, even under a pressure of 200 to 300 atmospheres, but if cooled a much smaller pressure suffices. Thus, at —11° it is liquefied under a pressure of 50 atmospheres; at —5° under a pressure of 70 atmospheres; at —1° under a pressure of 100 atmospheres, while at 0° it remains gaseous, even under 150 to 200 atmospheres. What may be called the critical point, therefore, seems to be just under zero. In these conditions of liquefaction it resembles marsh gas (CH_4) with which it has great chemical analogy.—*Comptes Rendus*, pp. 88, 236.

O. Emmerling has made some experiments on the preparation of *metallic phosphides*, working with great pressure obtained by the use of sealed tubes. He considers that in this way only can the metal be made to take up the maximum amount of phosphorus and yield a compound of definite chemical composition. The metal was placed in a glass tube, having been previously drawn out to wire, and covered with an excess of phosphorus. The tube was then completely exhausted and fused shut while in this state, the phosphorus having, in the mean time, melted. The tubes were always opened in an atmosphere of carbonic acid gas so as to avoid oxidation of the products or of the excess of phosphorus. The results with different metals were as follows:

Phosphorus and copper yielded a brittle, crumbling mass of dull silvery lustre, containing 66·5 per cent. Cu. This would appear to be CuP, which demands 66·4 per cent. Cu. Sp. gr. 5·14.

Phosphorus and magnesium yielded a blueish-gray infusible mass, which rapidly oxidized to magnesium phosphate so that it could not be analyzed.

Phosphorus and aluminium yielded no compound.

Phosphorus and mercury yielded no compound.

Phosphorus and silver yielded a black, very brittle mass of the

formula AgP, containing 77·5 per cent. Ag. Theoretical, 77·7 per cent. Ag.

Phosphorus and cadmium, after several trials, yielded a gray, partially fused mass of the composition Cd_2P, containing 87·4 per cent. Cd.

Phosphorus and zinc yielded a fused crystalline substance of the composition Zn_3P_2, containing 75·25 per cent. Zu.

Phosphorus and iron yielded no compound.

Phosphorus and tin yielded two compounds, according to the amount of phosphorus used, whether in excess or not. One possessed the formula SnP, containing 79·01 per cent. Sn, and the other SnP_2, containing 64·97 per cent. Sn. The former was tin-white in color, while the latter was black and very lustrous.—*Berichte,* xii, p. 152.

J. W. Brühl describes a method of *cleansing mercury* that has become impure through amalgamation with other metals, etc. It consists very simply in the use of "chromic acid" mixture, that is bichromate of potassium and dilute sulphuric acid; 5 grams bichromate and several cubic centimeters of strong sulphuric acid are dissolved in 1 liter of water, and then shaken up with an equal volume of the impure mercury. A small amount of red mercurio-chromate forms at first, which disappears as the impurities are oxidized, and finally the solution remains pure green. The only solid residue left besides the purified mercury is a gray powder, consisting of the oxides of the metals which had been amalgamated, which is removed by washing with distilled water. Mercury, so impure as to be almost solid, can be purified rapidly in this way with a loss of $\frac{1}{2}$ per cent. or less.—*Berichte,* xii, p. 204.

Organic Chemistry.—N. Franchimont has submitted *sandal wood* and *caliatur wood* again to an investigation, with a view of ascertaining the character of their coloring matter and whether its constitution was in any way related to known aromatic compounds. The coloring matter extracted and purified gave on analysis figures corresponding to $C_{17}H_{16}O_6$. Fused with potassium hydrate it gave, along with traces of a volatile compound having the odor of rose wood, acetic acid, resorcin, and, most probably, protocatechuic acid and pyrocatechin.

While his results do not give him any certain conclusions as to the constitution of the coloring matter, yet they establish the relations of

this substance to the aromatic compounds, and especially to protocatechuic acid.—*Berichte*, xii, p. 14.

E. H. Letts has obtained two new hydrocarbons from *turpentine oil*. On adding metallic sodium to fused turpentine hydrochlorate a violent reaction ensues, and, on distilling the product of the action, there is obtained a substance which, on cooling, solidifies to a white compound, while at higher temperatures an oil comes over. The first solid compound fuses at 94° and boils at 157° to 158°, and has the composition $C_{10}H_{17}$. To this the name of "Turpenyl" was given. The second compound boils at 321°, and possesses the formula $C_{20}H_{34}$, and is called "Diturpenyl.—*Eng. Corresp. Berichte*, xii, p. 135.

H. Köhler has investigated the oil of the *Gaultheria punctata* and *Gaultheria leucocarpa*, fine specimens of which were obtained from Dr. de Vrij. It was of interest to know whether these oils contained methyl-salicylate as in the case of *Gaultheria procumbens*, or whether they might not contain the ethyl salicylate possibly. The *oleum gaultheriæ punctatæ* purified was optically inactive and distilled almost constant at 223°, forming a colorless liquid of strong refracting power and pleasant aromatic odor. It was analyzed and was saponified, and showed itself to be under all these tests methyl salicylate. Thus, the amount of salicylic acid obtained from it corresponded to the methyl ether and not to the ethyl ether; the oxidation yielded formic acid and no trace of aldehyd. Its composition is, therefore, essentially identical with the oil of the *Gaultheria procumbens*.

The *oleum gaultheriæ leucocarpæ* was, when rectified, a clear, almost colorless oily fluid of the same odor as the preceding oil. It is, also, optically inactive, and distills over at 221° to 223°, and is thus obtained perfectly colorless and with strong refracting power. Elementary analysis and saponification both gave the same result as before, showing it to be the methyl ether of salicylic acid.—*Berichte*, xii, p. 264.

GLEANINGS FROM THE GERMAN JOURNALS.

By Louis von Cotzhausen, Ph.G.

Emplastrum Plumbi Simplex.—Jul. Mueller recommends the following formula, which he claims yields an excellent plaster with very little trouble: Melt 7,500 grams lard with 7,500 grams olive oil in a large copper-kettle, and add immediately 3 liters hot water; then add

through a sieve, stirring constantly, 7,500 grams litharge, previously heated until entirely free from carbonic acid (*i. e.* until a little, mixed with nitric acid, causes no effervescence). Allow the mixture to stand over night and boil the plaster in the morning for 2 to 2½ hours with a moderate heat, without adding any water. The author has used this formula for some time past, and always successfully.—*Pharm. Ztg.*, Feb. 1, 1879, p. 70.

Analysis of Sapo-Viridis.—Bernbeck ascertained an excellent sample of green soap to consist of 14·17 parts of caustic potassa and soda, 44·92 parts of oil (calculated from the oleic acid found) and 40·91 parts of water. An alcoholic solution left a small residue consisting of alkaline carbonates.—*Pharm. Ztg.*, Feb. 1, 1879, p. 70.

Estimation of Sulphate in Carbonate of Sodium.—Dr. H. Klencke powders the salt, adds acetic acid to it until effervescence ceases, pours off the liquid and washes the residue with fresh acetic acid; all undissolved salt is Glauber salt; by drying and weighing this the percentage of the adulteration is ascertained.—*Pharm. Ztg.*, Dec. 25, 1878, p. 889.

Constitution of Sulphide of Copper Made by the Wet Process.—Julius Thomsen made an analysis of the precipitate obtained from solutions of oxide of copper by sulphuretted hydrogen, which proved that it is not cupric sulphide (CuS), but a compound having the formula Cu_4S_3.—*Ber. d. Deutsch. Chem. Ges.*, 1878, p. 2043.

The Unpleasant and Offensive Odor of Iodoform in mixtures with lard (1 : 10), collodium elasticum (1 : 10 or 1 : 7), olive oil or cacao butter (1 : 50) is easily overcome, according to the statement of Dr. Vulpius, by adding 1 to 2 drops of peppermint oil to every 10 grams of the mixture, which covers the iodoform odor entirely.—*Pharm. Ztg.*, Feb. 12, 1879, p. 95.

Presence of Iodide of Potassium in Iodoform.—Iodoform dissolves readily in collodion, yielding a clear, thick solution. On preparing such a solution with iodoform, apparently pure and answering all tests of the German Pharmacopœia, Jul. Müller observed it to become as thin as ether; further investigations proved that this was caused by the presence of potassium iodide and iodate in the iodoform.—*Pharm. Ztg.*, Feb. 1, 1879, p. 70.

Presence of Iron in Commercial Sodium Bicarbonate.—F. Schneider states that liquor sodæ chlorinatæ prepared with commercial sodium bicarbonate was of a blueish-red color, caused undoubtedly by the presence of iron in the bicarbonate; the color is not destroyed by boiling.—*Schweiz. Wochenschr.*, 1879, p. 19.

Presence of Copper in Ergotin.—On treating a warm aqueous solution of ergotin with bright iron, W. Steffen proved it to contain a dangerous quantity of copper. The contamination was probably caused by evaporating the ergotin in a copper dish.—*Schw. Wochenschr.*, 1879, p. 19.

A New Hydrocarbon from Resin-Oil.—If resin-oil is heated with sulphur to about 200°C., sulphuretted hydrogen and carbonic oxysulphide are liberated in large quantities. If the temperature is afterwards raised until the residue boils, a substance distills over which crystallizes in the receiver, and may be purified by pressing between bibulous paper and recrystallization from alcohol. It forms handsome, white, brilliant crystalline plates, resembling mother of pearl in appearance, and melting at 94 to 95°C. The same compound is also formed by the action of pentachloride of phosphorus on resin-oil, phosphoric oxychloride being formed. It cannot be distilled without undergoing decomposition, but yields a hydrocarbon melting at 86°C., like the former, soluble in ether and alcohol. The latter crystallizes in needles, and consists of 91·5 per cent. C and 8·2 to 8·5 per cent. H.—*Ber. d. deutsch. Chem. Ges.*, 1878, p. 2174.

Lupinin, a New Glucoside found in Lupinus luteus.—E. Schulze and J. Barbieri extracted the dry plants with 50 per cent. alcohol, precipitated the tincture with solution of subacetate of lead, decomposed the voluminous precipitate with sulphuretted hydrogen, and afterwards treated it with much warm water. On cooling, the filtrate deposited lupinin as a yellowish-white, fine, crystalline mass. It is scarcely soluble in cold and hot water and alcohol, but very soluble in ammonia, soda and potassa, yielding dark yellow solutions, from which acids separate it again in very fine yellowish needles. It has the formula $C_{20}H_{32}O_{16}$, and when heated with diluted mineral acids it splits into sugar, probably dextrose, and an insoluble yellow product, lupigenin; formula, $C_{17}H_{12}O_6$.—*Ber. d. deutsch. Chem. Ges.*, xi, p. 2200.

Aspidospermia, an Alkaloid of Quebracho-Bark.—The bark of *Aspidosperma quebracho* (Schlechtendahl), nat. ord. *Apocyneæ*, a tree indigenous to the province of Santiago and the vicinity of Catarmarca, used for many years as a fever medicine, and considered by the physicians at Tucuman almost as efficacious as cinchona-bark, is described by Dingler as being about 1 to 2 cm. in thickness, covered with a thin corky layer of a brownish-yellow color. A fresh transverse section is more or less red, has dark yellowish-brown irregular concentric and somewhat confluent lines (*suberous lamellæ*) and whitish spots (*sclerenchyma cells*). The inner bark is pale yellow and coarsely fibrous, the bast bundles being oblique and irregular, running in different directions. Aspidospermia, the alkaloid, was obtained by Fraude by extracting 1·5 kg. of finely-contused bark in a percolator with a mixture of 5 liters of water and 100 g. concentrated H_2SO_4, precipitating the dark-brown percolate with concentrated solution of lead acetate in slight excess, in order to remove tannic acid and most of the coloring matter, filtering, and, after removing lead by sulphuretted hydrogen, treating with sodium carbonate until alkaline. The precipitate was collected, dried, extracted with strong alcohol, boiled with animal charcoal, again filtered, the greater portion of the alcohol removed by distillation, and an equal bulk of water added to the remainder, when, on slow evaporation, the alkaloid separated in brown crystals, which were purified by treatment with animal charcoal and recrystallization. The alkaloid crystallizes in small white glossy prisms, is readily soluble in alcohol and ether, scarcely in water, and melts at 205 to 206°C. Its composition is either $C_{22}H_{30}N_2O_2$ or $C_{22}H_{28}N_2O_2$.—*Ber. d. deutsch. Chem. Ges.*, 1878, p. 2189.

The Wax of Ficus Gummiflua is used for illuminating purposes by the natives of several districts of Java, where the plant is indigenous, and consists of a brittle, scaly, chocolate-colored mass, softening when heated, becoming adhesive and melting between 60 to 70°C.; boiling water extracts from the wax a large quantity of brown coloring matter, which is entirely precipitated by solution of subacetate of lead. Boiling alcohol dissolves considerable of the wax, which deposits again on cooling. Fr. Kessel separated the wax previously decolorized into two constituents by dissolving in ether and adding alcohol until the precipitate ceased to be redissolved; one constituent is readily and the other sparingly soluble in ether; the latter amounts to about 1-20 of the

crude wax, melts at 62°C., and has the composition $C_{27}H_{56}O$, while the former crystallizes from a mixture of alcohol and ether in small warty crystals, melting at 73°C., and having the composition $C_{15}H_{30}O$. —*Ber. d. deutsch. Chem. Ges.*, 1878, p. 2112.

Jelly-like Silicic Acid, an Inorganic Membrane for Dialysis. —If a diluted solution of soluble glass is poured into hydrochloric acid in a certain proportion, a clear liquid is obtained, which gradually congeals into an almost entirely transparent jelly; by treating this with water until the washings no longer caused an opalescence with silver solution, F. Ullik removed all sodium chloride and HCl, and silicic acid was obtained as a transparent gelatinous mass, retaining the former shape, drying in the air to a transparent substance, decreasing to about one fifth of the original bulk; the approximate constitution of this silicic acid is SiO_3H_2; if quickly heated to redness the pieces disintegrate into a brilliant sand, while if gradually and carefully heated they retain their glass-like transparent appearance; the specific gravity is 2·322 to 2·324. The author prepared both thin and thick sheets of this jelly-like mass, which answered comparatively well as a membrane for dialysis.—*Ber. d. Deutsch. Chem. Ges.*, 1878, p. 2124.

Reaction between Chloral Hydrate and Ammonium Sulphocyanate.—M. Nencki and H. Schaffer heated chloral hydrate in a flask until entirely liquid, and added an equivalent quantity of dry, powdered ammonium sulphocyanate; the liquid turned brown and possessed the odor of chloral and of sulphocyanic acid; after removing the flask from the sand bath, and allowing the reaction to be completed at an ordinary room temperature, the cooled mass was mixed with much water, when a copious precipitate fell, which was collected on a filter and dissolved in hot 90 per cent. alcohol. The filtered solution deposited on cooling long, brilliant needles, at first yellow, but rendered snow-white by recrystallizing. The alcoholic mother-liquor still contained considerable of this substance, mixed with a brown resinous mass. The white needles dried over sulphuric acid were analyzed, and found to have the composition $C_5H_5Cl_6N_3S$; they are insoluble in water, aqueous mineral acids and alkalies, scarcely soluble in cold alcohol and ether, but readily in hot alcohol.—*Journ. f. Pract. Chem.*, 1878, p. 43.

Honey Purified with Bolus alba.—The following process is said

to yield an excellent preparation in a very short time: 20 pounds of honey are diluted with 30 or 40 pounds of water, heated to the boiling point and 1 or 1½ pound of bolus alba added, previously rubbed into a thin, uniform paste with water. The mixture is then boiled and the scum frequently removed, until a little in a test tube separates in a few minutes into a clear liquid and a precipitate. The mixture is then allowed to settle for ½ hour, filtered while hot through wet filters and the filttate evaporated quickly to the proper consistence, stirring constantly.—*Pharm. Ztg.*, Feb. 15, 1879, p. 103.

Paracotoin, a Specific for Cholera.—Prof. Baelz, at Tokio, (Japan), reports that he cured 5 cases of cholera last summer by injecting 0.2 gram (at a time) of paracotoin hypodermically. In one case the patient became even constipated, necessitating a dose of castor oil. The principal disadvantage connected with using paracotoin (especially hypodermically) is its insolubility in suitable liquids. Equal parts of glycerin and water seem to make the most suitable solvent.—*Pharm. Ztg.*, Feb. 1, 1879, p. 71.

Glycerin, a Dressing for Burns and Scalds.—Dr. Th. Koller applies syrupy pure glycerin to fresh burns and scalds, and claims that it is an excellent remedy, removing all pain, and preventing blisters, inflammation and gathering.—*Pharm. Ztg.*, Nov. 6, 1878, p. 769.

Codliver Oil with Iron is prepared by A. du Bell by mixing in a porcelain mortar 1 gram crystallized ferric chloride (Fe_2Cl+6H_2O) with 200 grams codliver oil and 2 grams concentrated lactic acid, when a clear solution is obtained, having the odor of codliver oil and a mild, pleasant taste.—*Pharm. Ztg.*, Feb. 15, 1879, p. 103.

Production of Codliver Oil in Norway in 1878.—Monrad Throhn states that 50,000,000 codfish were caught in 1878; the total quantity of oil exported was 66,000 casks, each containing 100 kilos; 4,000 casks (=400,000 kilos) of this were white oil prepared by steam, 12,000 casks (=1,200,000 kilos) yellow medicinal oil, 12,000 casks common oil for technical purposes, 8,000 casks brownish-yellow oil, and 30,000 casks brown oil for tanning; considerable of the latter is still used for medicinal purposes in Belgium, Holland and France.—*Pharm. Handelsbl.*, Feb. 12, 1879, p. 7.

SODIUM ETHYLATE, OR CAUSTIC ALCOHOL.

By Benj. W. Richardson, M.D., F.R.S.

The interest taken in my introduction of ethylate of sodium into medical and surgical practice leads me to think that the following brief essay on three points—historical, therapeutical, pharmaceutical—relating to that introduction may prove acceptable to the numerous readers of the "Pharmaceutical Journal."

1. *Historical.*—I brought the ethylates of sodium and potassium, with some other of the ethylate series, originally into notice for practical use so far back as 1870. I first reported on them to the British Association for the Advancement of Science in 1870, and in the same year I made them the subject of one of my lectures on "Experimental and Practical Medicine," upon which occasion I demonstrated the mode of making the ethylates of sodium and potassium and performed several experiments on blood, serum and living tissues, with the sodium ethylate. In the same year, I also tested the practical application of what had been suggested to me by experiment. I removed by the use of sodium ethylate a large nævus from a child, who was under the care of my friend, Mr. Gay, at the Great Northern Hospital. The nævus had previously been subjected to treatment by the ligature and by other methods, including the free use of nitric acid, without success. I supplied in this year, 1870, to the Great Northern Hospital the specimen of the ethylate which came (fortunately) into the hands of Dr. Brunton, who in the next year used it for nævus with equal success. Dr. Brunton stated at the Medical Society of London that a house surgeon of the Great Northern Hospital gave him the specimen of the ethylate as a remedy for nævus without telling him of what it was composed. Dr. Brunton, who had missed seeing my report, had therefore to get the specimen examined by a chemical friend before he knew to what agent he was indebted for his success. Afterwards, through the same friend, he learned that the ethylate had been introduced by myself, and he was so kind as to inform me of the circumstances. If the ethylates should come into use in medicine and pharmacy these facts from me will fix the date of their introduction definitely, viz., as September 1870, at the meeting of the British Association for the Advancement of Science, held at Liverpool under the presidency of Professor Huxley.

2. *Therapeutical.*—In applying the ethylates, I had before me a definite object derived purely from experimental research. I found by experiment that I possessed in the ethylates of sodium and potassium bodies which, on being brought into contact with the moist living tissues, were decomposed, caustic alkali being produced and ethylic alcohol being reproduced by the extraction and decomposition of the water of the tissues. If, therefore, I inferred, I applied an ethylate to a vascular living tissue, I ought to get four results on application, viz. (*a*), a removal or absorption of water from the tissue into the ethylate; (*b*) the destructive action of a caustic from the caustic soda that would be formed; (*c*) coagulation from the alcohol that would be reproduced; (*d*) prevention of decomposition of the dead organic substance that would be formed. The first instance in which the ethylate of sodium was used gave all these results, and future experience has confirmed the principle. At this moment I have a case in hand in which a large vascular growth is reduced by the ethylate to a mere dry mass of scale or scab by four applications.

It is not, however, by every degree of dilution or of concentration of the ethylate that the results can be arrived at. If the ethylate be too concentrated the caustic or destructive action is over severe and hæmorrhage may follow, like as from an incised wound. This is specially the fact with ethylate of potassium, and for that reason I prefer to recommend the ethylate of sodium of a strength I shall name at the close of this paper.

Therapeutically, the ethylates admit of a wide range of action. I have already used the sodium ethylate with success in a case of a wound from the bite of a dog, and I should infer that as an application to wounds from snake bite it would be of signal service. I need not enter into these subjects here, but whatever may be the future of the ethylates as remedies the first use of them was based on pure experimental research and the observations derived from it, a research which was a repetition to the letter, varied only in respect to details, of the mode with which I inquired into the action of nitrite of amyl, and determined its true place as a remedial agent.

3. *Pharmaceutical.*—In order that the intention of the ethylates, as I have proposed them for use, may be properly fulfilled, they must be sent out by the pharmacist as absolute alcohols, and for that reason absolute ethylic alcohol must be used it their manufacture.

If sodium ethylate is to be sent out for use by pharmacists in the solid form, I agree with Mr. Williams that the solution for medical use had better be dispensed by the process of dissolving the solid ethylate in absolute alcohol. The proportion, however, which he suggests, 1 part of the solid ethylate to 2 of alcohol, is under the mark. One part to 1½ would be the better proportion. By the formula I gave in the "Lancet," I aimed to save the time of the busy dispenser who might only have absolute alcohol and metallic sodium in his laboratory. By experiments I found that a solution made in the way I described, without actually crystallizing out the ethylate, answered so perfectly that I proposed the plan for convenience sake, and specimens since made in that way, and which have been submitted to me, have proved perfectly satisfactory. At the same time I have no prejudices, and I bow willingly to Mr. Williams' far greater pharmaceutical knowledge and skill—a knowledge and skill which is, certainly, second to none.[1]

I have one word more to add, and that relates to the mode of sending out the ethylate to the profession of medicine ready for use. It is best dispensed in a bottle furnished with a glass stopper ending in a pointed glass rod, which descends into the fluid. The fluid is best applied from the glass point. It may, however, be applied very neatly by means of a clean quill, cut like a pen, and prepared fresh, that is to say newly nibbed each time. When the glass rod stopper is not at hand the pen is a simple, effective and inexpensive method. I am trying to have a platinum pen or pencil made, by which the fluid may, in some cases, be inoculated into a part. On one or two occasions I have applied the solution from a small glass syringe; but, on the whole, the glass rod and quill pen are, I think, the best. The glass brush is very inadvisable; the small fibres break off, and, in one instance, a portion of fibre left on a surface touched with the ethylate caused great pain and trouble.—*Condensed from Phar. Jour. and Trans.*, Dec. 14, 1878, p. 485.

[1] The formula which I ordinarily prescribe is as follows: Put ½ a fluidounce of absolute alcohol (sp. gr. 0·795) into a 2-ounce test tube. Set the test tube up in a bath of water at 50°F., and add, in small pieces at a time, cuttings of pure metallic sodium. A gas, hydrogen, will at once escape. Add the sodium until the gas ceases to escape, then raise the temperature of the water in the bath to 100°F., and add a little more sodium. When the gas again ceases to escape stop adding sodium, or, if the fluid, which by this time will be of gelatinous consistency, should crystallize, then stop. Afterwards cool down to 50°F., and add ½ a fluidounce more of absolute alcohol. With specimens of the ethylates made in this manner I have had the most excellent results.—B.W. R.

THE AMOUNT OF ASH AND SOLUBLE MATTER IN THE THREE SORTS OF BUCHU.

By Henry Williams Jones, F.C.S.

The following results were obtained during an examination of a number of samples of buchu intended for commercial purposes, and, in the absence of any exact information respecting the composition of the three sorts, yielded, respectively, by *Barosma betulina*, Bartling, *B. crenulata*, Hooker, and *B. serratifolia*, Willd., it is thought such results, though necessarily imperfect so far as showing the actual composition of the species is concerned, might prove interesting.

It has been previously shown by Mr. P. W. Bedford[1] that of the three species the short-leaved yield on an average 1·21 per cent. of volatile oil, whilst the long-leaved, *B. serratifolia*, gives only ·66 per cent.

The drug was successively treated by dry ether, alcohol and water until exhausted. The resulting solutions were evaporated to dryness on the water-bath, and the extracts so obtained dried in an air-bath at 240°F. until they ceased to lose weight.

The ether extract when so dried was quite free from the characteristic smell of buchu, and therefore contained no essential oil, and represented the chlorophyll, fixed oily matter, and such other substances soluble in ether.

In the case of the aqueous extract the amount of mineral matter present was deducted.

Ash and Soluble Matter in the Three Kinds of Buchu.

(*Three different samples of each species.*)

	Percentage Results.			
	Ash.	Soluble in ether.	Soluble in alcohol.	Soluble in water.[2]
Barosma betulina,	4·69	4·62	12·11	13·91
" "	4·47	4·29	13·96	14·25
" "	4·40	3·85	8·79	17·91
Barosma crenulata,	4·32	5·70	11·26	13·99
" "	4·01	5·86	15·73	20·72
" "	5·39	4·01	10·10	17·75
Barosma serratifolia,	5·03	4·78	11·57	17·92
" "	5·55	4·31	9·87	17·05
" "	5·22	3·91	7·71	22·38

The ash was remarkable for containing a large amount of manganese, and the aqueous extract for a large quantity of mucilaginous

[1] "Proceed. Amer. Pharm. Assoc.," 1863, p. 211.

[2] The mucilage is diffusible rather than soluble.

matter. One hundred grains of *B. serratifolia*, when powdered and boiled with water, yielded ten fluidounces of thick mucilage. To separate the fragments of exhausted leaves the thick liquid so obtained was filtered through a plug of cotton wool, by atmospheric pressure, into a flask exhausted of air. A bright liquor was thus obtained, which under the microscope showed no leaf fragments.—*Phar. Jour. and Trans.*, Feb. 15, 1879, p. 673.

THE CHEMICAL ELEMENTS.

By J. Norman Lockyer, F.R.S.

I have recently announced to the Royal Society that, reasoning from the phenomena presented to us in the spectroscope when known compounds are decomposed, I have obtained evidence that the so-called elementary bodies are in reality compound ones.

Although the announcement took this form, the interest taken in science nowadays by the general public is so great that it is apt to travel beyond the record; and, as able editors are not content to wait for what the experimentalist himself has to say, they are often at the mercy of those who, perhaps more from misapprehension than anything else, are prepared to provide columns filled with statements wide of the mark. Nor is this all. If there be a practical side to the work, some "application of science" is brought to the front, and the worker's own view of the labor is twisted out of all truth.

This has happened in my case. The idea of simplifying the elements is connected with the philosopher's stone. The use of the philosopher's stone was to transmute metals; therefore I have been supposed to be "transmuting" metals; and imaginations have been so active in this direction that I am not sure that, when my paper was eventually read at the Royal Society, many were not disappointed that I did not incontinently then and there "transmute" a ton of lead into a ton of gold.

It is in consequence of this general misapprehension of the nature of my work, that I the more willingly meet the wishes of the editor that I should say something about it. The paper itself I need not reproduce, as it has appeared *in extenso* elsewhere;[1] but there are many points touching both the origin of the views I have advanced and the work which has led up to them, on which I am glad of the opportunity of addressing a wider public.

It is now upward of ten years since I began a series of observations having for their object the determination of the chemical constitution of the atmosphere of the sun. The work done, so far as the number of elementary substances found to exist in it, I summed up in a former article;[2] but the ten years' work had opened up a great number of problems above and beyond the question of the number of elements which exist in the solar atmosphere, because we were dealing with elements under conditions which it is impossible to represent and experiment on here.

[1] "American Journal of Science and Arts."

[2] Printed in the "Popular Science Monthly Supplement" for August, 1878.

In the first place, the temperature of the sun is beyond all definition; secondly, the vapors are not confined; and, thirdly, there is an enormous number of them all mixed together, and free, as it were, to find their own level. Nor is this all. Astronomers have not only determined that the sun is a star, and have approximately fixed his place in nature as regards size and brilliancy, but they have compared the spectrum of this star, this sun of ours, with those of the other bodies which people space, and have thus begun to lay the foundations of a science which we may christen Comparative Stellar Chemistry. Dealing with the knowledge already acquired along this line, we may say roughly that there are four kinds of stars recognizable by their spectra.

We have first the brightest and presumably hottest stars, and of these the spectrum is marvelously simple—so simple, in fact, that we say their atmospheres consist in the main of only two substances—a statement founded on the observation that the lines in the spectra are matched by lines which we see in the spectra of hydrogen and calcium; there are traces of magnesium, and perhaps of sodium too, but the faintness of the indication of these two latter substances only intensifies the unmistakable development of the phenomena by which the existence of the former is indicated.

So much, then, for the first class; now for the second. In this we find our sun. In the spectra of stars of this class, the indications of hydrogen are enfeebled, the the evidences by which the existence of calcium has been traced in stars of the first class are increased in intensity, and, accompanying these changes we find all simplicity vanished from the spectrum. The sodium and magnesium indications have increased, and a spectrum in which the lines obviously visible may be counted on the fingers is replaced by one of terrific complexity.

The complexity which we meet with in passing from the first class to the second is one brought about by the addition of the lines produced by bodies of chemical substances of moderate atomic weight. The additional complexity observed when we pass from the second stage to the third is brought about by the addition of lines due in the main to bodies of higher atomic weight. And—this is a point of the highest importance—at the third stage the hydrogen, which existed in such abundance in stars of the first class, has now entirely disappeared.

In the last class of stars to which I have referred, the fourth, the lines have given place to fluted bands, at the same time that the light and color of the star indicate that we have almost reached the stage of extinction. These facts have long been familiar to students of solar and stellar physics. Indeed, in a letter written to M. Dumas, December 3, 1873, and printed in the "Comptes Rendus," I thus summarized a memoir which has since appeared in the "Philosophical Transactions":

Il semble que plus une étoile est chaude, plus son spectre est simple, et que les éléments métalliques se font voir dans l'ordre de leurs poids atomiques.[1]

Ainsi nous avons:

1. Des étoiles très-brillantes où nous ne voyons que l'hydrogène *en qantité énorme*, et le magnésium;

2. Des étoiles plus froides, comme notre soleil, où nous trouvons:

| Hydrogène + Magnésium + Sodium
| Hydrogène + Magnésium + Sodium + Calcium + Fer, . . . ;

dans ces étoiles, pas de métalloïdes;

[1] The old system of atomic weights was the one referred to.

3. Des étoiles plus froides encore, dans lesquelles *tous les éléments métalliques sont associés*, où leurs lignes ne sont plus visibles, et où nous n'avons que les spectres des métalloïds et des composés.

4. Plus une étoile est âgée, *plus l'hydrogène libre disparaît*; sur la terre, nous ne trouvons plus d'hydrogène en liberté.

Il me semble que ces faits sont les preuves de plusieurs idées émises par vous. J'ai pensé que nous pouvions imaginer une "*dissociation céleste*," qui continue le travail de nos fourneaux, et que le métalloïdes sont des composés qui sont dissociés par la température solaire, pendant que les éléments métalliques monatomiques, dont les poids atomiques sont les moindres, sont précisément ceux qui resistent même à la température des étoiles les plus chaudes.

Before I proceed further I should state that, while observations of the sun have since shown that calcium should be introduced between hydrogen and magnesium for that luminary, Dr. Huggins' photographs have demonstrated the same fact for the stars, so that in the present state of our knowledge, independent of all hypotheses, the facts may be represented as follows:

Hottest Stars Sun Cooler Stars	Lines[2] of	H + Ca + Mg H + Ca + Mg + Na + Fe — — Mg + Na + Fe + Bi + Hg	
Coolest	Fluted bands of	— — — — — —	Fluted Spectra of Metals and Metalloids.

I have no hesitation in stating my opinion that in this line of facts we have the most important outcome of solar work during the last ten years; and if there were none others in support of them, the conclusion would still stare us in the face that *the running down of temperature in a mass of matter which is eventually to form a star is accompanied by a gradually increasing complexity of chemical forms*.

This, then, is the result of one branch of the inquiry, which has consisted in a careful chronicling of the spectroscopic phenomena presented to our study by the various stars.

Experimentalists have observed the spectrum of hydrogen, of calcium, etc., in their laboratories, and have compared the bright lines visible in the spectra with the dark ones in the stars, and on this ground they have announced the discovery of calcium in the sun or of hydrogen in Sirius.

In all this work they have taken for granted that in the spectrum thus produced in their laboratories, they have been dealing with the vibration of one unique thing, call it atom, molecule or what you will; that one unique thing has by its vibrations produced all the lines visible, which they have persistently seen and mapped in each instance.

It is at this point that my recent work comes in, and raises the question whether what has been thus taken for granted is really true. And now that the question is raised, the striking thing about it is that it was not asked long ago.

One reason is this: Time out of mind—or, rather, ever since Nicolas Le Fèvre, who wes sent over here by the French King at the request of our English one at the time the Royal Society was established, pointed out that chemistry was the art of *separations* as well as of *transmutations*—it has been recognized that, with every increase

[2] Symbols are used here to save space. H = Hydrogen, Ca = Calcium, Mg = Magnesium, Na = Sodium, Fe = Iron, Bi = Bismuth, Hg = Mercury.

of temperature, or dissociating power, bodies were separated from each other. In this way Priestly, from his "plomb rouge," separated oxygen, and Davy separated potassium; and as a final result of the labor of generations of chemists, the million-fold chemical complexity of natural bodies in the three kingdoms of nature has been reduced by separations till only some seventy so called elements are left.

Now this magnificent simplification has been brought about by the employment of moderate temperatures—moderate, that is to say, in comparison with the transcendental dissociating energies of electricity as employed in our modern voltaic arcs and electric sparks.

But, in the observations made during the last thirty years on the spectra of bodies rendered incandescent by electricity, *we have actually, though yet scarcely consciously been employing these transcendental temperatures*, and, if it be that this higher grade of heat does what all other lower grades have done, then the spectrum we have observed in each case is not the record of the vibrations of the particular substance with which we have imagined ourselves to be working only, but of all the simpler substances produced by the series, whether short or long, of the "separations" effected.

The question then, it will be seen, is an appeal to the law of continuity, nothing more and nothing less. Is a temperature higher than any yet applied to act in the same way as each higher temperature, which has been applied, has done? Or is there to be some unexplained break in the uniformity of nature's processes?

The definite reason for my asking the question at the present time has been this: The final reduction of four years' work at a special branch of the subject to which I will refer presently, on the assumption that at the temperature of the electric arc we do not get such "simplifications," has landed me in the most helpless confusion, and if I do not succeed in finding a higher law than that on which I have been working, my four year's work, in this direction at all events, will have been thrown away.

This and other reasons compel me to hold that the answer to the question put is, that what has been taken for granted is, in all probability *not* true. But before I proceed to give the reasons for the faith that is in me I must, at the risk of being both technical and tedious when I should wish to be neither, lead up to the understanding of them.

The spectroscope, however simple or complex it may be, is an instrument which allows us to observe the image of the slit through which the light enters it, in the most perfect manner. If the light contains rays of every wave-length, then the images formed by each will be so close together that the spectrum will be continuous, that is, without break. If the light contains only certain wave-lengths, then we shall get certain, and not all, of the possible images of the slit, and the spectrum will be discontinuous.

Again, if we have an extremely complex light-source, let us say a solid and a mixture of gases giving us light, and we allow the light to enter, so to speak, indiscriminately into the spectroscope, then in each part of the spectrum we shall get a summation—a complex record—of the light of the same wave-length proceeding from all the different light-waves. But if by means of a lens we form an image of the light-source, so that each particular part shall be impressed in its proper place on the slit-plate, then in the spectrum the different kinds of light will be sorted out.

There is a simple experiment which shows clearly the different results obtained. If we observe the light of a candle with the spectroscope in the ordinary manner, that is, by placing the candle in front of the slit at some little distance from it, we see a band of color—a continuous spectrum—and in one particular part of the band we see a yellow line, and occasionally in the green and in the blue parts of the band other lines are observable. Now, if we throw an image of the candle on to the slit—the slit being horizontal and the image of the candle vertical—we then get three perfectly distinct spectra. We find that the interior of the candle, that is the blue part (best observed at the bottom of the candle), gives us one spectrum, the white part gives us another, while on the outside of the candle, so faint as to be almost invisible to the eye, there is a region which gives as a perfectly distinct spectrum with a line in the yellow. In this way there is no difficulty whatever in determining the co-existence of three light-sources, each with its proper spectrum, in the light of a common candle.

We see in a moment that much the same condition of affairs will be brought about if, instead of using a candle, we use an electric arc, in which the pure vapor of the substance which is being rendered incandescent fills the whole interval between the poles, the number of particles and degree of incandescence being smaller at the *sides* of the arc. We can throw an image of such an *horizontal* arc on a vertical slit; the slit will give then the spectrum of a section of the arc at right angles to its length. The vapor which exists farthest from the core of the arc has a much more simple spectrum than that of the core of the arc itself. The spectrum of the core consists of a large number of lines, all of which die out until the part of it farthest from the centre gives but one line.

In this way the spectrum of each substance furnishes us with *long* and *short* lines, the long lines being common to the more and less intensely heated parts of the arc, and the short lines more special to the more heated one. This is the first step.

It has been necessary to enter thus at length into the origin of the terms long and short lines, because almost all the subsequent work which need be referred to now has had for its object the investigation of the phenomena presented by them under different conditions. The first results obtained were as follows:

1. When a metallic vapor was subjected to admixture with another gas or vapor, or to reduced pressure, I found that its spectrum became simplified by the abstraction of the shortest lines and by the thinning of many of the remaining ones. To obtain reduction of pressure, the metals were inclosed in tubes in which a partial vacuum was produced. *In all these experiments it was found that the longest lines invariably remained visible longest.*[1]

[1] In the case of zinc the effect of these circumstances was very marked, and they may be given as a sample of the phenomena generally observed. When the pressure-gauge connected with a Sprengel pump stood at from 35 to 40 millimeters, the spectrum at the part observed was normal, except that the two lines 4924 and 4911 (both of which, when the spectrum is observed under the normal pressure, are lines with thick wings) were considerably reduced in width. On the pump being started these lines rapidly decreased in length, as did the line at 4679—4810 and 4721 being almost unaffected; at last the two at 4924 and 4911 vanished, as did 4679 and appeared only at intervals as spots on the poles, the two 4810 and 4721 remaining little changed in length, though much in brilliancy. This experiment was repeated four times, and on each occasion the gauge was found to be almost at the same point, viz.:

1st observation, when the lines 4924 and 4911 were gone, the gauge stood at 30 millimeters.
2d " " " " " " " " 29 "
3d " " " " " " " " 29 "
4th " " " " " " " " 31 "

2. When we use metals chemically combined with a metalloid—in other words, when we pass from a metal to one of its *salts* (I used chlorine)—only the longest lines of the metal remain. The number is large in the case of elements of low atomic weight, and small in the case of elements of high atomic weight, and of twice the atom-fixing power of hydrogen.

3. When we use metals mechanically mixed, only the longest lines of the smallest constituent remain. On this point I must enlarge somewhat by referring to a series of experiments recorded in the "Philosophical Transactions," 1873.

A quantity of the larger constituent, generally from five to ten grams, was weighed out, the weighing being accurate to the fraction of a milligram; and the requisite quantity of the smaller constituent was calculated to give, when combined, a mixture of a definite percentage composition by weight (this being more easily obtainable than a percentage composition by volume).

The quantities generally chosen were 10, 5, 1 and 0·1 per cent.

In a few cases, with metals known to have very delicate spectral reactions, a mixture of 0·01 per cent was prepared.

Observations were then made of the spectrum of each specimen, and the result was recorded in maps in the following manner: First, the pure spectrum of the smallest constituent was observed, and the lines laid down from Thalén's map.

The series thus mapped was as follows:

Tin + Cadmium,	percentages of	Cd	10, 5, 1, 0·15
Lead + Zinc	"	Zn	10, 5, 1, 0·1
Lead + Magnesium,	"	Mg	10, 1, 0·1, 0.01

The observations showed that the lines of the smallest constituent disappeared as the quantity got less. Although we had here the germs of a quantitative spectrum analysis, the germs only were present, because from the existence of several "critical points," and great variations due to other causes, the results obtained were not constant.

In a subsequent research on the gold-copper alloys used in the coinage, Mr. Roberts, the Chemist of the Mint, and myself were able to show that the shortening in the length of the lines by reduced quantity was such a definite physical effect following upon reduced quantity, that a difference of $\frac{1}{10000}$ part of copper in gold could be detected.

We are now in possession of the facts utilized in the work which has led up to the subject discussed in the present paper.

They have been utilized along two perfectly distinct lines of thought:

(1) They have been used in an attempt to enable us to produce a spectrum of a substance free from lines due to the impurities which are almost always present.

(2) They have been used to indicate the existence and amount of dissociation when acknowledged compounds have been submitted to the action of different and increasing temperatures.

I will deal with (1) first.

The elimination of impurity lines is conducted as follows: The spectrum of the element is first confronted with the spectra of the substances most likely to be pres-

ent to impurities. This is most conveniently done by photographing the spectra on the same plate one above the other, so that common lines are continuous.

The retention or rejection of lines coincident in two or more spectra is determined by observing in which spectrum the line is thickest; where several elements are mapped at once, all their spectra are confronted on the same plate, as by this means the presence of one of the substances as an impurity in the others can be at once detected.

Lines due to impurities, if any are thus traced, are marked for omission from the map and their true sources recorded, while any line that is observed to vary in length and thickness in the various photographs is at once suspected to be an impurity line, and if traced to such is likewise marked for omission. I give a case.

The two lines H and K (3933 and 3968), assigned both to iron and calcium by Angström, are proved to belong to calcium in the following way:

a. The lines are well represented in the spectrum of commercial wrought iron, but are absolutely coincident with two thick lines in the spectrum of calcium chloride with which the iron spectrum was confronted.

b. The lines are represented by mere traces in the spectrum of a specimen of pure iron prepared by the late Dr. Matthiessen. Both poles of the lamp were of iron, the lower pole consisting of an ingot of the metal which had been cast in a lime-mold.

c. The lines are altogether absent in a photograph of pure iron, where both poles of the lamp were of pure metal *not* cast in lime, and they are likewise absent in a photograph of the spectrum of the Lenarto meteorite.

By eliminating lines due to impurities in the manner just described, a spectrum is at length obtained, of which every line is assignable to the particular element photographed, the same temperature being employed in the case of all the elements observed.

With regard to the second line of work, I should commence by stating that from a beautiful series of researches carried on by several methods, Mitscherlich concluded in 1864 *that every compound of the first order, heated to a temperature adequate for the production of light, is not decomposed, but exhibits a spectrum peculiar to this compound.*

In some experiments of my own, communicated to the Royal Society in 1873, I observed:

First. That whether the spectra of iodides, bromides, etc., be observed in the flame or a weak spark, *only the longest lines of the metals are visible*, showing that only a small quantity of the simple metal is present as a result of partial dissociation, and that by increasing the temperature, and consequently the amount of dissociation, *the other lines of the metal appear in the order of their length with each rise of temperature.*

Secondly. I convinced myself that while in air, after the first application of heat, *the spectra and metallic lines are in the main the same, in hydrogen the spectra are different for each compound, and true metallic lines are represented according to the volatibility of the compound, only the very longest lines being visible in the spectrum of the least volatile compound.*

Thirdly. I found that with a considerable elevation of temperature *the spectrum of the compound faded almost into invisibility.*

These results enable us to make the following statement:

A compound body, such as a salt of calcium, has as definite a spectrum as that given by the so-called elements; but while the spectrum of the metallic element itself consists of lines, the number and thickness of some of which increase with the increased quantity, the spectrum of the compound consists in the main of channeled spaces and bands, which increase in like manner.

In short, the molecules of a simple body and a compound one are affected in the same manner by quantity in so far as their spectra are concerned; *in other words, both spectra have their long and short lines*, the lines in the spectrum of the element being represented by bands or fluted lines in the spectrum of the compound; and in each case the greatest simplicity of the spectrum depends upon the smallest quantity, and the greatest complexity upon the greatest.

The heat required to act upon such a compound as a salt of calcium, so as to render its spectrum visible, dissociates the compound according to its volatility; the number of true metallic lines which thus appear is a measure of the quantity of the metal resulting from the dissociation, and as the metal lines increase in number, the compound bands thin out.

These results bring us face to face with the subject matter of the recent work.

First with regard to impurity elimination. I find that, although the method is good for detecting and eliminating impurities, there are still short-line coincidences between metals which are pure.

This "higher law" has come out in the following manner:

For the last four years I have been engaged upon the preparation of a map of the solar spectrum on a large scale, the work including a comparison of the Fraunhofer lines with those visible in the spectrum of the vapor of each of the metallic elements in the electric arc.

To give an idea of the thoroughness of the work, at all events in intention, I may state that the complete spectrum of the sun, on the scale of the working map, will be half a furlong long; that to map the metallic lines and purify the spectra in the manner described, more than 100,000 observations have been made and about 2,000 photographs taken.

In some of these photographs we have vapors compared with the sun; in others vapors compared with each other; and others again have been taken to show which lines are long and which short in the spectra.

A rigorous application of the system of impurity elimination formed, of course, a large part of the work.

The final reduction of the photographs of all the metallic elements in the region 39—40—a reduction I began in the early part of last year—summarized all the observations of metallic spectra compared with the Fraunhofer lines accumulated during the whole period of observation, and all the results of the impurity elimination.

Now this reduction has shown me that the hypothesis that identical lines in different spectra are due to impurities is not sufficient. I show in detail in the paper the hopeless confusion in which I have been landed.

I find short-line coincidences between many metals the impurities of which have been

eliminated, or in which the freedom from mutual impurity has been demonstrated by the absence of the longest lines.

The explanation of this result on the hypothesis that the elements are elementary does not lie on the surface, but it does on the assumption that they are compounds and behave like them.

This is the first point. We now pass from the results brought about *at the same temperature with different substances* to those observed *at different temperatures with the same substance*.

I find that when *the temperature is greatly varied*, the elements behave spectroscopically exactly as compound bodies do, as we have already seen. New lines are developed with increasing temperatures, and others fade in precisely the same way as the metallic lines made their appearance in the salts at the expense of the latter, which faded too.

In short, the observations and reasoning which I formerly employed to show how acknowledged compounds behave in the spectroscope are now seen to indicate the compound nature of the chemical elements themselves.

In a paper communicated to the Royal Society in 1874, referring, among other matters, to the reversal of some lines in the solar spectrum, I remarked:

"It is obvious that greater attention will have to be given to the precise *character* as well as to the position of each of the Fraunhofer lines, in the thickness of which I have already observed several anomalies. I may refer more particularly at present to the two H lines 3933 and 3968 belonging to calcium, which are much thicker in all photographs of the solar spectrum (I might have added that they were by far the thickest lines in the solar spectrum) than the largest calcium line of this region (4226·3), this latter being invariably thicker than the H lines in all photographs of the calcium spectrum, and remaining, moreover, visible in the spectrum of substances containing calcium in such small quantities as not to show any traces of the H lines.

"How far this and similar variations between photographic records and the solar spectrum are due to causes incident to the photographic record itself, *or to variations in the intensities of the various molecular vibrations under solar and terrestrial conditions*, are questions which up to the present time I have been unable to discuss."

The progress of the work has shown that the differences here indicated are not exceptions, but are truly typical when the minute anatomy of the solar spectrum is studied.

Kirchhoff, indeed, as early as 1869 seems to have got a glimpse of the same thing, for in his memorable paper, which may justly be regarded as the basis of all subsequent work, he is careful to state that the sixty iron lines in the sun, to which he referred, only agree "*as a rule*" in intensity with those observed in the electric spark. Those who have given an account of his work have not always been so cautious. Indeed, I find Professor Roscoe[1] running far beyond the record in the following sentence:

"In order to map and determine the positions of the bright lines found in the electric spectra of the various metals, Kirchhoff, as I have already stated, employed the dark lines in the solar spectrum as his guides. Judge of his astonishment when he

[1] "Spectrum Analysis," third edition, p. 240.

observed that dark solar lines occur in positions connected with those of all the bright iron lines! Exactly as the sodium lines were identical with Fraunhofer's lines, so for each of the iron lines, of which Kirchhoff and Angström have mapped no less than 460, a dark solar line was seen to correspond. Not only had each line its dark representative in the solar spectrum, *but the breadth and degree of shade of the two sets of lines were seen to agree in the most perfect manner, the brightest iron lines corresponding to the darkest solar lines.*"

This statement was made to prove the absolutely identical nature of the iron vapor in the sun's atmosphere and in the electric spark. As the statement is not true, the vapors can hardly be identical.

Such, then, is the reasoning on which I base the two counts in the indictment against the simple nature of the elementary bodies.

First, the common lines visible in the spectra of different elements at high identical remperatures point to a common origin. Secondly, the different lines visible in the spectra of the same substance at high and low temperatures indicate that at high temperatures dissociation goes on as continuously as it is generally recognized to do at all lower temperatures.

In my paper I attempt to show that if we grant that the highest temperatures produce common bases—in other words, if the elements are really compounds—all the phenomena so difficult to account for on the received hopothesis find a simple and sufficient explanation. And, with regard to the second count, I discuss the cases of calcium, iron, lithium and hydrogen. I might have brought, and shall subsequently bring, other cases forward. In all these I show that the lines most strongly developed at the highest temperatures are precisely those which are seen almost alone in the spectra of the hottest stars, and which are most obviously present in the spectrum of our own sun. Now, if it be true that the temperature of the arc breaks up the elements, then the higher temperature of the sun should do this in a still more effective manner. Here, then, we have a test.

I have put this question to the sun, and I have sent in a second paper to the Royal Society embodying a preliminary discussion of Professor Young's work at Sherman, Tacchini's observations, and my own. In this paper I state my grounds for the believe that all the solar phenomena we have been watching with our spectroscopes for the last ten years can not be explained on the existing hypothesis, and that they are simply and sufficiently accounted for by supposing that primordial atoms are associated in the corona and dissociated in the reversing layer.

In this way the vertical currents in the solar atmosphere, both ascending and descending, the intense absorption in sun-spots, their association with the faculæ, and *the apparently continuous spectrum of the corona*, and its structure, find an easy solution.

We are yet as far as ever from a demonstration of the cause of the variation in the temperature of the sun; but the excess of so-called calcium with minimum sun-spots, and excess of so-called hydrogen with maximum sun-spots, follow naturally from the hypothesis, and afford indications that the temperature of the hottest region in the sun closely approximates to that of the reversing layer in stars of the type of Sirius and *a* Lyræ.—*Popular Science Monthly*, March, 1879.

OPIUM SMOKING AMONG THE CELESTIALS.

By Rich V. Mattison, Ph.G., M.D.

As one passes through the Chinese quarter of San Francisco he cannot help being sharply impressed with the immense traffic in an article which is seemingly part of the very life necessities of this curious people. We seem scarcely to pass a shop, whether devoted to the sale of clothing or drugs or groceries, but what we find a notable proportion of the business to consist in the sale of opium. We pass the shop of the merchant, and while one assistant is counting out the gold for a bill of exchange on the Flowery Kingdom, we see another weighing carefully a small portion of the much coveted drug. The jeweler, surrounded by the precious bracelets of nephrite and phrenite, lays aside for the moment the curious golden circlet he is filing, to catch up the balance and poise upon the pan the little horn cup a moment, and again return to his employment. The grocer, surrounded by the many dainties of Mongolian gastronomy, stands under the rows of varnished fowls, balance in hand, dispensing the drug with the most imperturbable gravity and solemnity. As we stand by the half-open doorway on one of those beautiful summer evenings so common to Pacific climes, a young celestial enters the shop to return in a moment laden with his store of dreamy forgetfulness, the absorption of which transports him, in imagination, to his native land, where riding in a gorgeous palanquin, with maidens to fan him and coolies to fly at his slightest wish, he passes into his dwelling by the Kin-Sha-Kiang, or the river of the golden sands, where his wife, with the feet of a mouse, brings his tea in golden cups, and so he passes iuto the arms of Morpheus (or Morphia's meconic embrace), his couch covered with scarlet and silken curtains with fringes of golden strands, only to awake finding himself lying coiled up on a hard board shelf covered with matting, his head upon a block ; for now transported by the magic lamp of a private detective we are in the classic precincts of an opium den. To reach it we have passed through many dark, subterranean alleys, through courts of filth and squalor and wretchedness to any other than Mongolian eyes. On either side of the room, which is about sixteen feet square, are accommodations for twenty or more smokers—shelves rising in tiers like the bunks of a steamer's cabin. In the centre is a small table covered with the shells, bowls, cups, lamps and other paraphernalia of a first-class opium den, sustained by liberal patronage. It was early evening, scarcely midnight, and at our right inclined a strong, sleek, almond-eyed native of a foreign land, well known to our guide as one of the most inveterate smokers of the city. Immediately in front of him was a small saucer filled with lamp oil, and inverted over it was a tumbler in the bottom of which (or the apex as it was placed) a small hole was drilled, through which protruded a piece of wick—this being lighted constituted the lamp. By its side lay an oyster-shell containing a quantity of a dark colored extract, and on either side a long wire exactly like the knitting needles of our grandmothers, excepting that one extremity ends in a small spoon. The pipe is naturally of interest. The most usual style is that having a shaft of bamboo, resembling somewhat a flute pierced laterally at each extremity, at one of which is fitted a small metal cup in which to receive the bowl of the pipe proper. This bowl is of earthen or metal, and is about three and a half inches in diameter, convex on both its upper and lower

surfaces, the latter ending in a tube of half an inch diameter and of similar length; this fits into the metal cup of the bamboo shaft. The upper convex surface is pierced in the centre with a metal tube, having a funnel-shaped aperture about one thirty-second of an inch in diameter. The cavity of the bowl, as here exhibited, is of a capacity of nearly a hundred cubic centimeters.

The pipe is filled by taking up on the apex of one of the knitting needles a small portion of the extract, usually from 2 to 5 grains, and holding it momentarily in the flame of the lamp, rotating the needle dexterously meanwhile, then withdrawing it only to repeat the same operation until the extract is dried to light brown color and of just such consistency that it sticks to the pipe, when, with a dexterous twist, the point of the needle is inserted into the apex opening of the upper convex surface of the bowl, and the needle instantly withdrawn by a rotary motion; this manœuvre places the extract in the shape of an inverted pyramid, with a central opening communicating with the orifice leading into the cavity of the bowl. It is during this evaporation of the extract over the lamp that the cultivated smoker judges of the quality of the opium: if it bubbles up to that delicate shade of light brown, and, at the same time, gives off the peculiar odor so characteristic to the trained olfactory nerve bulbs of the Mongolian smoker, then is he satisfied of the quality of the extract purchased.

The bowl being filled, it is inverted over the flame of the lamp at an angle of about 45°, and the volatilizing narcotic rapidly drawn by a few strong inspirations into the body of the pipe, and so on into the pulmonary cavities. The inspiration thus made is peculiar; it is not only buccal, but more strongly pulmonary. The inspiration is slow and deep and prolonged, until the chest is filled with the narcotic vapor, and expiration then occurs with the mouth closed, and the expired smoke issuing slowly through the nostrils.

The quantity smoked varies greatly with different smokers, it varying from 30 grains to upwards of 300 or 400 grains at one sitting, this being from 10 to 100 pipefuls of the extract. The whole process is done in the most methodical manner. The veriest coolie or wealthiest merchant proceeds to arrange his lamp and extract and pipe with a solemn gravity ludicrous to behold. In this grave affair of state, perhaps five, ten or even fifteen minutes are consumed, then follows an interval of placidity in those unaccustomed to smoking, to be followed by another and another smoke. But we begin to feel almost like opium smokers ourselves breathing so long the atmosphere DeQuincy called "the mephitic regions of carbonic acid gas," so we ascend to the upper regions of the street, and realize, as we never have before, the fresh, invigorating influence of the brisk midnight air of the ocean coast.

Philadelphia, Twelfth mo. 30th, 1878.

PHARMACEUTICAL COLLEGES AND ASSOCIATIONS.

Philadelphia College of Pharmacy.—The examination of the members of the *Junior Class* was held on the afternoon and evening of February 15th. In addition to twelve specimens of medicinal chemicals, drugs and pharmaceutical preparations

set out for examination and recognition, the following questions were handed to the students to be answered in writing:

CHEMISTRY.

A.—1. What is the velocity of Light? 2. How is a ray of white light affected in passing through a prism? 3. How many simple or elementary colors are there? 4. Enumerate them. 5. Describe how white light may be re-formed by the union of the elementary colors. 6. What is meant by spectrum analysis? 7. How does the spectrum of one metal differ from that of another? 8. What would be the difference in appearance between the solar spectrum and the spectrum of an element like sodium? 9. What is meant by the refraction of light? 10. What is phosphorescence.

B.—1. Do bodies expand or contract under the influence of heat? 2. Give an experiment illustrative of this with a solid, 3, a liquid, and 4, with gases. 5. Name and describe the instruments used to measure temperatures. 6. Give the fixed points and graduation of the one in common use. 7. How may any number on one scale be converted into the corresponding number on another scale? 8. Convert 60° Fahrenheit into the corresponding reading of the Centigrade scale. 9. Convert 79·4° Centigrade into the corresponding reading on the Fahrenheit scale. 10. What are the limits of heat and cold that may be determined with the mercury thermometer?

C.—1. What is the correct chemical name for Muriatic Acid? 2. Give the method by which it may be obtained as a gas, and describe its collection. 3. Describe some of its properties. 4. Give the properties of the officinal Acidum Muriaticum. 5. What is its action on Zinc, and 6, upon Zinc Oxide? 7. Write the reaction for each of these actions. 8. What are the chief uses of Muriatic Acid? 9. What class of compounds result generally from its action? 10. Illustrate this by examples.

PHARMACY.

D.—How were the units of length, capacity and weight obtained in the French Metrical System? Give the value of each in the system of weights and measures used in this country.

E.—Explain how the following processes are practically performed: 1. Percolation. 2. Sublimation. 3. Crystallization. 4. What special precautions are necessary to observe with each to ensure success.

F.—Define the following pharmaceutical terms: 1. Cerate. 2. Ointment. 3. Vinegar. 4. Syrup. 5. Fluid Extract. 6. Emulsion. 7. Extract. 8. Tincture. 9 Liniment. 10. Plaster.

MATERIA MEDICA AND BOTANY.

G.—Define briefly the nature of parenchyma and prosenchyma cells, and of ducts or vessels. State where they are found in stems, in barks and in leaves.

H.—What is Ergot, and on what plants is it found? Describe briefly its development.

I.—Give the botanical characters of the natural order of Ranunculaceæ. Which ranunculaceous herbs are officinal? Give their botanical names and state their habitat. What are their most important chemical constituents?

COMMITTEE.

K—What is a Cotyledon? What are plants called which have one, two and three or more Cotyledons? Name an example of each.

L.—Water—What is its chemical composition? Specific gravity? Proportion of constituents by weight? Proportion of constituents by volume? Freezing and boiling point? Point of maximum density? How can it be separated into its elements? What is the purest form of water found in nature? What is the pure officinal form? What are the impurities of natural waters?

M.—Describe two methods of obtaining substances in fine powders by the use of

liquids. How many degrees of fineness of powders are recognized by the United States Pharmacopœia? Give the Pharmacopœia name of each degree of fineness, with the number attached to it, and explain what the number refers to. How are powders usually prepared and dispensed upon Physicians' prescriptions?

About two-thirds of the candidates passed the examination in all the branches successfully; the remainder will come up for a supplementary examination in one or more branches near the close of September next, at which time also students from other Colleges, who have not passed the junior examination, will be examined. The precise time will be announced hereafter. Students intending to be present should report by letter to the actuary of the College, Mr. Thos. S. Wiegand, on or before September 1st.

The examinations of the *senior students* commenced February 27th and closed March 4th with the examination in practical manipulations. The written examinations were conducted on four consecutive days on the following subjects:

QUESTIONS IN CHEMISTRY.

A. What is "Sal Sodæ" of the shops, and from what natural source was it formerly obtained? From what salts is it prepared on a large scale? Give the process for its manufacture and explain the chemical changes in each stage of the operation. Give the composition of the crystallized salt, and describe its general physical properties. What changes are produced in it by exposure to air and to heat? State the forms in which it is officinal and the names they bear in the U. S. Pharmacopœia. What salt is formed by saturating it with carbon dioxide? Describe the process used and state the changes which take place. By what tests may its full saturation be ascertained? What are the effects of heat upon it, both when dry or dissolved?

B. State the chemical nomenclature of the two principal classes of iron salts, and give an example of each. State the quantivalence of the iron in each class, and give the symbol for iron with notation denoting the quantivalence. Give the general distinctive properties of the soluble salts of the two classes. State the officinal method of obtaining "Liquor Ferri Chloridi," U. S. P., and explain the chemical changes which take place in each stage, both by words and by formulæ. What officinal preparation contains this solution? In what respect does this differ chemically from the "Liquor?"

C. Give the chemical name for "Lunar Caustic," and state its mode of preparation, with formula of the reaction. Give the names under which it is officinal, and state what difference exists either in appearance or composition of its different forms. Which of these is intended for internal use, and why? Is either form subject to adulteration; if so, which, and what is generally used for this purpose? How can this adulteration be detected?

D. State the composition and mode of preparing Ammonium Nitrate. What are the effects of heat upon it, both at moderate and high temperatures? Name any new compounds resulting from its decomposition, and give a formula of the reaction. State any precautions necessary to be taken in effecting its decomposition.

E. What is the probable composition of "Calx Chlorinata?" Give the mode by which it is made, and any precautions necessary to be taken. Give the formula for the reaction that takes place. What are the properties which render it useful in medicine and the arts? What are the effects of the action of acids upon it?

F. What is the difference in the action of pure and of ordinary water on lead, and to what is the difference due? Which acid is the best solvent for lead, and what are the products formed? Is the salt thus formed used pharmaceutically, and for what purpose? Why is it preferred to the more common lead salt?

G. What metal exists in lime, and with what element is it combined? From which of its compounds is lime usually obtained, and in these with what other metallic compound is it associated? Give its general properties, and the physical

and chemical changes which take place in it from exposure to air and moisture. What effect has alteration of temperature upon the solubility of lime?

H. What are the antidotes for Arsenic? State the mode in which they act.

I. What tests are capable of distinguishing from each other the Salts of Potassium, Sodium and Ammonium?

K. Which of the elementary bodies is now considered essential to all acids? What relation does the number of atoms of this element bear to the basicity of the acid?

QUESTIONS IN MATERIA MEDICA.

A. From which plant or plants, and from which natural order, is *sarsaparilla* obtained? Give a general description of its physical and of its structural characteristics. Name the principal commercial varieties, and state briefly in what respects they differ. Which constituents of sarsaparilla are of medical and pharmaceutical interest?

B. What is *squill?* Give the name, natural order and habitat of the plant yielding it. Describe the drug, its varieties and its affinity for moisture. What causes irritation of the skin on handling the drug? Name its medicinal properties, the doses in which it is given and the principles to which its remedial properties are due.

C. Give the source of *guaiacum wood* as to the plant or plants, natural order and country producing it. Give a concise description of the drug. State which portion of the wood is richest in the medicinal principle, how this principle is obtained in the native country of the drug, and what are its characteristic chemical reactions. What medical virtues are attributed to guaiacum?

D. Describe the *physical* and *structural* characteristics of each of the following varieties of *Cinchona barks:* quilled calisaya bark, flat calisaya bark, quilled red bark, flat red bark and pale bark.

E. Name the plants, with their native country, of the natural order of *Solanaceæ*, yielding officinal leaves. State how these leaves may be distinguished from one another, and upon which principles their medical properties chiefly depend.

F. Describe the principal properties and reactions of *eugenic acid;* state in which officinal drugs the acid is found; name the plants and the natural order from which these drugs are obtained, and briefly describe each one of the drugs.

G. Give the name, the natural order and the habitat of the plant yielding *poppy*, and state when the drug should be collected. Describe the principal physical and structural characteristics of the drug, and state in what respect the varieties of the drug differ from one another. What are its medical properties?

H. Name those *officinal drugs* which naturally occur in the state of *powder*, and give of each the name of the plant and the part yielding it. Describe briefly the structural characteristics of each drug.

I. What is *storax?* From what plant, natural order and country is it obtained? What is the cause of its opaqueness? Name its principal constituents, and state which indigenous product resembles it in composition.

K. Give the name, class, order and habitat of the animal yielding *castor*. Explain the location of the latter in the body of the animal. Describe the drug, and name its medical properties and dose.

QUESTIONS IN PHARMACY.

A. What proximate principles are usually present in Fixed Oils? Express in words the chemical composition of the proximate principles present in Olive Oil. What change takes place in these principles when Olive Oil is heated with Oxide of Lead and water? Name the liquid soluble in water produced by this reaction. How many grams of this liquid would a bottle hold which contains 29·53 cc. of pure water at 4°C.?

B. Give the ingredients and unabbreviated officinal names of the following preparations: Aromatic Spirit of Ammonia, Syrup of Ginger, Tincture of Belladonna, Mercurial Ointment, Wine of Rhubarb, Fluid Extract of Ergot, Green

Iodide of Mercury, Acetate of Potassium, Tincture of Nux Vomica (with proportions), Mezereon Ointment.

C. Give the ingredients and English names for Acetum Scillæ, Acidum Sulphuricum Aromaticum, Ceratum Cetacei, Collodium cum Cantharide, Confectio Rosæ, Infusum Gentianæ Compositum, Liquor Arsenici et Hydrargyri Iodidi, Pilulæ Aloes et Mastiches, Liquor Iodinii Compositus, Syrupus Rhei Aromaticus.

D. Name the oil found naturally in the Bitter Almond. Explain the process for preparing Volatile Oil from the Bitter Almond. What is its chemical name and its unabbreviated officinal name? What poisonous Acid is usually found in the Volatile Oil? How may this Acid be removed? What crystallizable Acid is apt to be found in old specimens? How does the Sweet Almond differ from Bitter Almond in chemical composition? Name two officinal preparations of Sweet Almonds. Name three officinal preparations of Wild Cherry. State how each is prepared.

E. What is Malt? How does its taste differ from that of Barley? What is the difference in taste due to? What fermentative principle is present in Malt? Name the products formed by fermentation of Malt in the order in which they are formed. What solid crystalline substance is found coating the interior of wine casks? What is its chemical composition? What impurities does it contain? Describe how the Acid present in it is made. Give a test for the Acid.

F. What is Pepsin? What are its medical properties? How is it prepared for use by Scheffer's process? What is the standard of strength adopted for Saccharated Pepsin? What two liquid preparations of Pepsin are in common use, and what are their principal faults? Name three officinal preparations of Cantharides. What are the special uses of each? Give the ingredients in each. State what officinal Acid is obtained from milk; give the specific gravity of the Acid. Name an officinal preparation.

G. Name the three principal Alkaloids present in Opium. What peculiar Acid is present in Opium? What are the tests for this Acid? What are the tests for the principal Alkaloids? What emetic preparation is prepared from the principal Alkaloid? What is its dose? What are the officinal liquid preparations of Opium? Give the proportion of Powdered Opium in each fluidounce. State the object of using Ether in one of the liquid preparations.

H. How is officinal Sweet Spirit of Nitre prepared? What peculiar Ether does it contain? Explain the rationale for the production of Sweet Spirit of Nitre. What is its specific gravity and usual adulteration? What are the officinal tests? What pharmaceutical preparation is made by a similar process from Amylic Alcohol? What is its use in medicine? How is it administered and dispensed?

I. How is Syrup of the Iodide of Iron prepared? What is the modern chemical name for the Salt contained in it? What other officinal preparation contains the same Salt? State how this preparation is made. Give the pharmacopœial tests for this preparation. How is Monsel's Solution prepared? What is its unabbreviated officinal name? What is its specific gravity? What solid preparation is made from it? What are its medical uses?

K. Into what three classes are Volatile Oils usually divided? What are the proximate constituents of most Volatile Oils? How are Volatile Oils obtained from plants? How may Alcohol be detected when used to adulterate Volatile Oils? How may Fixed Oils be detected? What are Oleo-resins? Give the officinal name of a natural Oleo-resin. State how the Oleo-resins forming a class in the U. S. Pharmacopœia are made. What is the best way of dispensing Oleo-resins with aqueous mixtures? Illustrate by a practical example.

QUESTIONS BY THE EXAMINING COMMITTEE.

A. Name the three officinal Alums. State the full officinal title of each without abbreviations. Give the chemical formula of each. What is the crystalline form

of each? Name another element which will substitute Potassium, and one which will substitute Aluminium in Alum. What test will distinguish Aluminium Salts from Magnesium Salts?

B. What are the sources of Citric Acid of commerce? Describe the mode of its preparation. What mineral Acid is it liable to be contaminated with? What Acid is formed by the action of heat on Citric Acid? What effect has red heat upon metallic Citrates? What is the saturating power of Citric Acid as indicated by the U. S. Pharmacopœia? What is its quantivalence? Name three preparations of the U. S Pharmacopœia into which it enters. How may adulterations with tartaric acid be detected?

C. State the officinal name of Galls. Give the botanical name, natural order and habitat of the plant which yields the drug. How are they formed? Name two active principles which they contain. Give the process for obtaining each of these active principles. How may they be distinguished chemically? What is a characteristic feature of good Galls?

D. Give the botanical name, natural order and habitat of the plant which yields Ipecacuanha. Describe briefly the physical and structural characteristics of the root. Describe one of the non-officinal Ipecacuanhas. Name the active principle of Ipecacuanha. In what portion of the root does it reside? What are the medical properties of Ipecacuanha? Give the officinal names and strength of three preparations containing Ipecacuanha.

E. Give the officinal names and ingredients of the following preparations (omitting quantities), with the dose of Black Drop and Huxham's Tincture: Black Drop, Huxham's Tincture of Bark, Brown Mixture, Seidlitz Powders, Basilicon Ointment.

F. Give the formula, and describe the process of making the following preparations (omitting quantities): Syrupus Senegæ, Potassii Citras, Pulvis Ipecacuanhæ Compositus, Liquor Plumbi Subacetatis, Ceratum Cantharidis.

G. Give the formula for preparing Liquor Ferri Chloridi, and explain in words what chemical changes take place. What is its specific gravity? State in what officinal preparation it is used. Give the formula for this preparation, and state its dose and medical properties.

H Give the officinal names and active principles of the following drugs; also the botanical names, natural orders and habitat of the plants which furnish them:

		Officinal Name.	Active Principle	Botanical Name.	Natural Order.	Habitat.
1	Aconite Root,					
2	Jalap,					
3	Seneka Root,					
4	Red Bark,					
5	Levant Wormseed,					
6	Deadly Nightshade,					
7	May Apple,					
8	Cloves,					
9	Nux Vomica,					
10	Rhubarb,					

I. Criticise the following prescriptions:

1.

℞—Quiniæ Sulph., . . . gr. xxxii
Acid. Sulph. Aromat., . f℥ss
Syrup. Zingiber., . . f℥i
Aquæ, ... f℥ii
Tinct. Valerianæ Ammoniatæ, ... f℥i
M. Sig.: Give a teaspoonful four times daily.

2.

℞—Mist. Potass. Citrat., . f℥iv
Spt. Aether. Nitros. . . f℥ss
Syrupi, ... f℥i
Tinct. Aconit. Rad., . f℥i
M. Sig.: Give a tablespoonful three times daily.

3.

℞—Hydr. Chlorid. Corrosiv., gr. ii
Acid. Hydrochlor. Dilut., f℥ii
Syrupi, ... f℥i
Aquæ, ... f℥vi
M. Sig.: Give a teaspoonful three times a day.

4. Diarbhœa Mixture.

℞—Cretæ Præparatæ, . . ℥iii
Pulv. Gum. Acaciæ, . ℥ii
Pulv. Opii, . . . ℥i
Glycerinæ, . . . f℥i
Aquæ Cinnam., . . f℥v
M. Sig.: A tablespoonful every hour.

5.

℞—Morphiæ Sulphat., ... gr. iii
Potassii Bicarb., ... ℥ii
Aquæ, ... f℥ii
M. Sig.: A teaspoonful every two hours.

K. Criticise Prescriptions No. 1 and 2.

1.

℞—Copaibæ, ... f℥iv
Tinct. Ferri Chloridi, . f℥iv
Pulv. Acaciæ, . . . ℥iv
Sacchari, ... ℥iv
Aq. Menth. Pip., ad . f℥iv
M. Sig: To be used as directed.

2.

℞—Tinct. Ferri Chlorid., . f℥iii
Liq. Ammonii Acetatis, . f℥iv
Ammonii Carbonatis, . ℥ss
Elixir Curaçoa, . . f℥i
Syrup. Cort. Aurant., . f℥iss
Aquæ, q. s. ut. ft. . . f℥viii
M. Sig.: Basham's Mixture.

3. Write out a prescription for 12 powders, each containing 10 grains of Dover's Powders, giving the ingredients separately in Latin, without abbreviations.

4. Translate the following:

℞—Morphiæ Sulphatis centigrammata viginti quinque.
Acidi Hydrochlorici decigrammata tria.
Spiritus Vini Gallici grammata septem et dimidium.
Aqua destillatæ grammata viginti duo et dimidium.
Misceatur, Detur, Signetur: 30 drops 3 or 4 times a day.

5. Translate the following, and change the Metrical Weights to Troy Weights:

℞—Hydrargyri Chloridi Corrosivi, . . . 0·6
Solve in Aquæ destillatæ gutt. nonnullis.
Adde Pulveris Opii, ... 0·3
" Glycyrrhizæ Radicis, . . . 5·0
" " Extracti, . . . 8·0
Misce exactissime. Fiant pilulæ 100 Lycopodio Conspergantur

The following is the list of specimens in each department which had been placed upon the table for examination:

Chemistry.	Materia Medica.	Pharmacy.	Examining Committee.
Potassii carbonas.	Asarum.	Liquor potasii permang.	Potassii bromidum.
Potassii nitras (granul.).	Veratrum viride.	Infusum Salviæ.	Potassii chloras.
Potassii chloras.	Juglans.	Syrupus Ferri Iodidi.	Uva ursi.
Potasii bichromas.	Gaultheria.	Extract. Ergotæ fluidum.	Salvia.
Sodii chloridum.	Santonica.	Aqua Menthæ viridis.	Acidum gallicum.
Sodii bicarbonas.	Cocculus.	Acidum sulphurosum.	Infus. Gentianæ comp.
Liquor Calcis.	Delphinium.	Alcohol amylicum.	Tinct. Gentianæ comp.
Alumen.	Sassafras Medulla.	Pulvis aromaticus.	Tinct. Opii camphorata.
Ferri subcarbonas.	Tapioca.	Confectio Rosæ.	Syrupus Scillæ.
Tinct. ferri chloridi.	Resina.	Ferri citras.	Extr. Pruni Virg. fluid.

For the practical examination, the preparation of an oil emulsion, of pills, lozenges and an ointment, had been selected.

The following candidates passed the examination, and were recommended for the degree of Graduate in Pharmacy:

James Polk Aaron, Pennsylvania, *Soda Water Apparatus.*
Emanuel Allison Alleman, Pennsylvania, *Eriodictyon Glutinosum.*
Alexander Bonnell Allen, New York, *Glycerin.*
John Reese Allen, Delaware, *Natural Mineral Waters.*
Louis Ancker, South Carolina, *Citron.*
Alfred Croskey Ashmead, Pennsylvania, *Rubus Villosus.*
George Hickman Bancroft, Pennsylvania, *Pharmaceutical uses of Ung. Petrolei.*
Thomas Barnes, Jr. Pennsylvania, *Apis Mellifica.*
W. Wallace Beitenman, Pennsylvania, *Althæa as a Pill Excipient.*
John Jacob Beyer, Pennsylvania, *Glycerole of Sub-Acetate of Lead.*
John Blankenhorn, New York, *Smilax Glauca.*
Joseph Brakeley, New Jersey, *Oil of Gaultheria.*
John Griscom Bullock, Pennsylvania, *O Pharmakopolos.*
Frederick White Carpenter, New York, *Sanguinaria Canadensis*
Edward Ligon Enders Castleton, Texas, *Percolation with Improved Apparatus.*
Hesser Charles Clapham, Pennsylvania, *Manufacture of Licorice.*
Alfred W. Cochran, New Jersey, *Alcoholic Fermentation*
David Costelo, Indiana, *Gambogia.*
Harry Oscar Cox, New Jersey, *Strychnos Nux Vomica.*
Harry Otis Cravens, Texas, *Licorice Lozenges.*
Walter Crawford, Pennsylvania, *Pharmaceutical and Medical Relationship.*
John P. Curran, Jr., Pennsylvania, *Grindelia Robusta.*
William George Day, Maryland, *Thymol as an Antiseptic.*
George Frank Deacon, New Jersey, *Arsenic and its Preparations.*
Robert P. Dinges, Pennsylvania, *Camphora Officinarum.*
Theodore Drake, New Jersey, *Glycerin and its Uses.*
Joseph B. Driver, Wisconsin, *Emulsions.*
George Morris Eckels, Pennsylvania, *Comparative Strength of Wines and Tincts.*
Maurice Edgar Eyler, Pennsylvania, *Ceratum Cantharidis.*
Clarence Preston Eyre, New Jersey, *Yerba Buena.*
Levi Fahnestock, Pennsylvania, *Valuation of Blistering Beetles.*
Hiland Flowers, Pennsylvania, *Lactuca Canadensis.*
John Henry Frederick, Pennsylvania, *Evaporation.*
William Kerr Freas, Pennsylvania, *Cimicifuga.*
Andrew G. Frey, Pennsylvania, *Cornus Florida*
Ernest Fruh, Pennsylvania, *Storage of Botanical Drugs.*
William Henry Gerhard, Pennsylvania, *Plasters.*
James Lord Graham, Delaware, *Glyceritum Picis Liquidæ.*
Edward Clarence Griffin, Michigan, *Emulsions*
Edwin Howard Hammer, Ohio, *Syrupus Ipecacuanhæ.*
Henry Gettman Haring, Pennsylvania, *Podophyllum Peltatum, Folia.*
Charles Albert Harrold, District of Columbia, *Dialyzed Iron.*
George William Henry, New Jersey, *Camphora Officinarum.*

CHARLES AUSTINE HIGGINS, New Jersey, *Potassii Bromidum.*
LEONARD ADKINS HUDSON, Delaware, *Bark of Cerasus Serotina.*
MORRIS ALBERT HULL, Pennsylvania, *Asclepias Tuberosa.*
WILLIAM BEETEM HUMRICH, Pennsylvania, *Unguentum Hydrargyri Nitratis.*
JOE JACOBS, Georgia, *Melia Azedarach.*
ROLAND DAVIS JONES, Delaware, *Citric Acid.*
EMIL JUNGMAN, Germany, *Present Miseries of Pharmacy and their Remedy.*
WILLIAM WILKINS KAIN, New Jersey, *Potassii Bitartras.*
LOREN DEWEY KAYS, Pennsylvania, *Cosmolin in Ointments.*
PATRICK MALCAHY KELLY, M.D, Pennsylvania, *Red Lead in Paint.*
GEORGE HENRY KING, Pennsylvania, *Hydrobromic Acid.*
HARRY CLARENCE LAWALL, Pennsylvania, *Carbonic Acid.*
ALEXANDER BENJAMIN LEVI, Pennsylvania, *Perfumery and its relations to Pharmacy.*
JOHN HERRMAN LOCKE, Pennsylvania, *Emplastrum.*
DANIEL LONGAKER, Pennsylvania, *Vanilla*
CHARLES EDGAR MCCOMAS, Maryland, *Hamamelis Virginica.*
EUGENE A. MCFADDEN, Pennsylvania, *Vanilla and its Extract.*
CLEMENT BROOK MCCULLOUGH, Pennsylvania, *Before attending College of Pharmacy.*
WATSON MEGILL, Kentucky, *Cultivation of Tobacco in Kentucky.*
EDWARD FREDERICK MENGER, Nebraska, *Ceratum Plumbi Subacetatis.*
JACOB MYERS MITCHELL, JR., New Jersey, *Organic Chemistry.*
WILLIAM MITTELBACH, New Jersey, *American Wines.*
DAVID MOFFET, Pennsylvania, *Euonymus Atropurpureus.*
BAYARD MURRAY, Pennsylvania, *Grindelia Robusta.*
EMILE OTT, Pennsylvania, *Hydrargyri Oxidum Flavum.*
WILLIAM RENICK PATTERSON, Ohio, *Syrupus Lactucarii.*
GEORGE ALEXANDER WOODSON PAYNE, Virginia, *History and Chemistry of Glass*
HORATIO GATES PETERS, Pennsylvania, *Sodii Boras*
CHARLES FRED. W PLIEBEL, Pennsylvania, *Nux Vomica.*
WILLIAM S. PLUMER, JR, South Carolina, *Cocculus Indicus.*
ERNEST P. RAAB, Illinois, *Ricinus Communis.*
AARON WILLIAM RADLEY, Pennsylvania, *Pharmaceutical Notes.*
FREDERICK RAPP, Illinois, *Saccharated Pepsin.*
EUGENE LEWIS REED, New Jersey, *Statice Caroliniana.*
WILLOUGHBY HENRY REED, Pennsylvania, *Hydrargyrum.*
CHARLES EDWARD RESAG, Germany, *Capsicum Annuum*
AFRED NATHAN RICHARDS, Pennsylvania, *Catechu-tannic Acid.*
CHARLES H. H. B. ROBERTS, Pennsylvania, *Eucalyptus.*
VICTOR CHRISTOPHER ROBERTS, New Jersey, *Toxicology.*
AUGUSTUS HARVEY ROSS, Pennsylvania, *Unguentum Zinci Oxidi.*
JOHN M. RUDOLPH, Pennsylvania, *Corallorhiza Odontorhiza*
WARREN BLACHLY RUSH, Ohio, *Copaibic Acid.*
CHARLES J. SIGLINGER, Pennsylvania, *Spigelia Marilandica.*
MOSES S. SIMPSON, Ohio, *Oils and Fats.*
JACOB DANIEL SMELTZER, Pennsylvania, *Honey*
AUGUTUS SWARTZ SMITH, Pennsylvania, *Glucose*
HENRY GEORGE SMITH, Pennsylvania, *Croton Chloral Hydrate.*
ALFRED DENNY SPARKS, Delaware, *Liquor Magnesii Citratis.*
GEORGE SYLVESTER SPEAKER, Pennsylvania, *Ceratum Plumbi Subacetatis*
THEODORE SPRISSLER, Pennsylvania, *Wood Products.*
ALBERT AUGUST GUSTAV STARCK, Illinois, *Unguentum Hydrargyri Nitratis*
OLIVER HENRY STERNER, Pennsylvania, *Dracontium Fœtidum*
JACOB FREDERICK STOCK, New Jersey, *Prinos Verticillatus.*
ALBERT H. STITES, Pennsylvania, *The Bark of Diospyros Virginiana.*
EMIL CONRAD THOMAS, Pennsylvania, *Prinos Verticillatus.*
WILLIAM CONRAD TROLL, Pennsylvania, *Pharmaceutical Education.*
ALEXANDER TURNER, Pennsylvania, *An Index of Strength in all Galenical Solutions.*

CURTIS WAUGH TURNER, Pennsylvania, *Toxicology in its Relation to Pharmacists*
JOHN BASKETTER TURNER, Pennsylvania, *Castanea.*
JOHN AUGUSTUS UHLAND, Pennsylvania, *Medicated Waters.*
ROBERT HAYS VANSANT, New Jersey, *Glucose in its Pharmaceutical Applications.*
MCCLANAHAN WADE, Virginia, *Simple Syrup.*
CHARLES HUGH WAGENER, New Jersey, *Carbon and its Compounds.*
EDWARD MORRELL WALLINGTON, New Jersey, *Emulsion of Codliver Oil.*
CHARLES WESLEY WATSON, Pennsylvania, *Pilulæ Zinci Phosphidi Compositæ.*
WILLIAM WENDEL, Germany, *Podophyllum Peltatum, Folia.*
JOHN LOUIS WESSELS, Germany, *Erythroxylon Coca.*
HENRY CLAY WHITNEY, New Jersey, *Apium Petroselinum.*
FRED TYACKE WILLIAMS, Pennsylvania, *Coffee.*
WILLIAM RUFUS WILSON, Pennsylvania, *Cydonium.*
GEORGE EDWARD WITSIL, Pennsylvania, *Honey and Glucose.*
WILLIAM WARREN WOODNUT, New Jersey, *Cosmolin as a Basis for some Officinal Ointments.*
MAX ROBERT ZAEGEL, Wisconsin, *Red Podophyllin.*

PASSED THEIR EXAMINATION IN JUNE, 1878.

AUGUST DRESCHER, New Jersey, *Examination of a Case of Supposed Arsenical Poisoning.*
THOMAS EDWARD BARRON KERNAN, Pennsylvania, *Solution of Oxychloride of Iron.*

An invitation had been extended by the professors to the successful candidates and the Board of Trustees of the College to assemble at the College hall on the evening of March 13th. Tables had been set in the museum, and after partaking of the refreshments provided for the occasion, speeches were made, toasts offered and responded to, and the conversation occasionally interspersed with songs, until the hour of adjournment arrived.

On the evening of March 14th a large audience was attracted to the Academy of Music, where the Fifty-eighth Annual Commencement was held, and the degrees conferred upon the graduates by the President of the College, Dillwyn Parrish. A gold medal, which had been offered by E. McInall, Ph.G., to the student passing the best examination in chemistry, was presented to Joseph Brakeley. Professor Remington delivered the valedictory address, at the close of which Rob. H. Vansant, on behalf of the class, presented a series of resolutions, handsomely engrossed and framed, expressive of the feeling of the class on learning of the resignation of Professor Bridges; they were received by Vice President Chas. Bullock in behalf of Prof. Bridges, who was absent, owing to indisposition. The class surprised Prof. Maisch with a handsome library table, on which was placed a silver set of exquisite workmanship, consisting of waiter, pitcher, goblets and bowl, which were presented by Curtis W. Turner. The exercises were interspersed with music, and closed with the distribution of flowers, books and other presents sent upon the stage by the friends of the graduates.

The steps taken a year ago for the celebration of the "Silver" Anniversary of the Zeta Phi Society were approved by the members of the different classes since 1854. The committee, on learning of the intended resignation of Prof. Bridges, quietly went to work, determined to erect a lasting monument to him, who had faithfully served the College in the chair of chemistry for 37 years. At the Anniversary meeting held on the evening of March 11th, in one of the lecture rooms of the College, the committee presented the result of their labors, the sum of $1,000,

to the College, with the stipulation that the fund be known as the "Robert Bridges Scholarship Fund," and that the interest thereof be annually appropriated toward defraying the expenses of one or more deserving students, under the direction of the Board of Trustees. In the course of the evening it was also announced that a friend of the College had offered to the class of 1879-1880 the sum of $100, as a prize, for the best thesis. The exercises over, the company was invited to proceed to the museum, where a collation was provided, and where the younger folks afterwards indulged in singing and dancing. A society has been formed, styled the "Zeta Phi Alpha Society," with the view of gathering the alumni tri-annually in a social reunion; its first president is Jos. L. Lemberger, Ph.G., of the class of 1854.

Massachusetts College of Pharmacy.—The annual meeting of the Massachusetts College of Pharmacy was held on March 3d, 1879. The following officers were elected: Thomas L. Jenks, M.D., President; B. F. Stacey, First Vice President; A. R. Bayley, Second Vice President; Thomas Doliber, Ph.G., Recording Secretary; Prof. G. F. H. Markoe, Ph.G., Corresponding Secretary; Charles I. Eaton, Treasurer; James S. Melvin, Auditor—Trustees: Henry Canning, Secretary; George H Cowdin, Ph.G.; Edward S. Kelley, Ph.G.; Chas. P. Orne, Ph.G.; S. A. D. Shepphard, Ph.G.; Charles A. Tufts, M.D., Ph.G.; I. Bartlett Patten, Daniel G. Wilkins.

The College introduced three new features the past year. First. Compulsory and Free Laboratory Exercise, in connection with the new chemical laboratory. This was opened last autumn, and will accommodate 256 students. Second. A Junior Examination in October for those students who failed to pass the regular Junior Examination in the spring. Third. Preliminary Examination in reading, writing, spelling, and arithmetic as far as and including fractions and proportions. This was announced in the College Catalogue of 1877-78.

The school of Pharmacy has been attended the present session by 114 students. The school suffered a great loss in the death of Prof. Merrick, which took place on the 25th of February of this year. Prof. Merrick had filled the chair of Chemistry for five years.

The College at this meeting voted a change in its by-laws, whereby wholesale druggists and manufacturers of pharmaceutical preparations can become members.

The retiring president, Mr. Sheppard, read an address detailing the events of the past year in reference to the College, and containing many valuable suggestions for its future welfare.

THOMAS DOLIBER, *Rec. Sec.*

New York College of Pharmacy.—The forty-ninth annual commencement took place in Chickering Hall on the evening of March 18th. After an address by the President, Mr. Ewen McIntyre, the degree of Graduate in Pharmacy was conferred on the following gentlemen:

Samuel Abraham, New York, *Urine.*
Louis Bangert, New Jersey, *Products of Destructive Distillation.*
Samuel M. Barbarow, New Jersey, *Pills and Excipients.*
Smith Bartlett, Cape Vincent, *Zinc and its Preparations.*
Conrad W. Braeutigam, New York, *Emplastrum Plumbi.*
Ernest Breiting, Germany, *Iodine and its Officinal Preparations.*
John Breuing, New Jersey, *The Various Processes of Pill Coating.*
Percival Brewer, Illinois, *The Comparative Quantity of Pure Phosphoric Acid in several samples of Diluted Phosphoric Acid of Commerce.*

Albert F. Brugman; New York, *The Food of Man.*
Christian F. Burger, Jr, Germany, *Citric Acid.*
Bernard F. Callaghan, New Jersey, *Diluted Phosphoric Acid.*
M. Frank Casey, Massachusetts, *Pharmacy and Pharmacopœial Preparations.*
Frederick Cassebeer, New York, *Quinine and its Salts.*
Herman F. Cassebeer, New York, *Opium and its Alkaloids.*
Thélesphore Chagnon, Canada, *Corrosive Sublimate.*
Fonwell C. Cutts, Massachusetts, *Belladonna and its Officinal Preparations.*
Charles N. Davidson, New York, *Practical Tests for Adulterations in Cod-Liver Oil.*
Carl Doepfner, Germany, *Mercury*
Hicko Dorestan, Wisconsin, *Volatile Oils, The Chief Adulterations and their Principal Tests.*
William H. Ebbit, New York, *Caloric in Changes of Aggregation.*
Walter E. Faber, New York, *Glycerin.*
Louis E. Feindt, New York, *Poisons.*
William W. Fowler, New Jersey, *The Adulterations of Cream of Tartar and their Detection.*
George Blair Frazee, Mississippi, *Disinfection and Disinfectants.*
George W. Freygang, New Jersey, *Cod-Liver Oil.*
Paul L. Frohwein, New Jersey, *Oxalic Acid and Oxalates.*
Theobald R. Frohwein, New York, *Estimation of the Morphia Strength of Tinctura Opii.*
Dennis Gerrity, New York, *Arsenic and its Compounds.*
Louis J. Golm, Illinois, *The Solubility of Pills.*
Martin Heldt, Jr., New York, *Antiseptics.*
James D. Hendrickson, New Jersey, *Qualitative Analysis of Urine.*
Frederick Herdling, Germany, *Thymus Vulgaris, its Constituents.*
August Hoerle, New York, *Salicylic Acid.*
George H. Hoerning, New Jersey, *Ergota.*
Hermagoras Isea, Venezuela, *Bromide of Potassium.*
John Kremer, Jr., New York, *Analysis of Urine.*
Henry E. C. Kuehn, Canada, *Water and its uses.*
Mathew Mahler, New York, *Aconitum Napellus and its Preparations.*
George J. Martin, New Jersey, *Eucalyptus Globulus.*
Charles H. May, Maryland, *Salix and Salicin.*
Isaac Meseritz, New York, *Glycerin as an Excipient in the Manufacture of Pills.*
Charles P. Moll, New York, *Chloroform.*
James T. Morehouse, New Jersey, *Products derived from Apis Mellifica.*
Robert Muellenbach, Germany, *Hydrate of Chloral.*
Simeon Nauheim, England, *The Salts and Scale Preparations of Iron.*
Sidney H. Neergaard, New York, *Hyoscyamus and its Officinal Preparations from the Dried American, English and German Leaves.*
John Oehler, New York, *The Flora of Bergen county, New Jersey.*
Herman Orlewitz, Germany, *Gold.*
Jacob Oswalt, New York, *Use of Disinfectants, Anticeptics, Deodorizers.*
Frederick W. Petri, New York, *Arsenic and Arsenious Acid.*
Jonas Pfeiffer, New York, *The Thermometer and Latent Heat.*
George Redder, New York, *Citric Acid.*
Floyd W. Rogers, Connecticut, "*The Two Paths*" (*in Pharmacy.*)
Hilon H. Sawyer, New York, *Acid. Hydrocyanic. Dilut. The Purity and Percentage strength of Commercial Samples.*
Gottlieb Schick, Missouri, *Antimony.*
Henry J Schleckter, New York, *Chemistry and its Atomic Theory.*
Gustavus Schlegel, New Jersey, *On Fluid Extracts.*
Frank A. D. Smith, New York, *Strychnos Nux Vomica.*
Mallory H. Taylor, Virginia, *Viscum Album.*

Greenleaf Voorhes, New Jersey, *Digitalis.*
William W. Washburne, New York, *Sulphuric Acid.*
Joseph Weidenfeld, Wisconsin, *Mercury and its Compounds*
Rudolph C. Werner, Germany, *Phosphorus and its Chemical and Pharmaceutical Preparations.*
Alfred W. Wiener, New York, *The Location of the Active Principle in the Spanish Fly.*
Alwin J. Wilhelm, New York, *Gum Benzoes and Benzoic Acid.*

The Alumni prizes, consisting of a gold, silver and bronze medal, were awarded to C. W. May, G. W. Freygang and R. C. Werner, the three graduates who had passed the best general examination; and a special prize, a microscope, was presented to John Oehler, the best student in botany and Materia Medica. Professor Chandler, on behalf of the Alpha Beta Gamma, presented to the College Johnson's "Universal Encyclopedia," in four volumes. The address of Judge H E. Howland, who was unable to be present, was read by Chas. P. Miller, and the Valedictory on behalf of the graduates was delivered by J L. Hendrickson. A crayon portrait of Prof. Frœbel was presented to the College by the Laboratory Class.

Alumni Association New York College of Pharmacy.—The annual meeting was held in the College building on Tuesday, March 17th. Starr H. Ambler occupied the chair, and 38 new members were elected. The President read his annual address. The Committee on Papers and Queries presented a report favoring the establishment of a money prize, to be awarded for original investigation and research into any particular pharmaceutical subject by members of the Alumni. The Treasurer's report showed the finances of the Association to be in a satisfactory condition. The annual election resulted in the choice of the following ticket:—

President, P. W. Bedford; Vice Presidents, George B. Frazer, Starr H. Ambler, H. L. Coit; Treasurer, Theobald Frohwein; Secretary, B. F. Hays; Register, L. M. Royce. Executive Board—Messrs. B. F. McIntyre, F. Herman, E. Montaunus, Jr., G. Inness. Delegates to the Twenty-seventh Annual Meeting of the American Pharmaceutical Association—Messrs. William Wright, Jr., J. L. Golin, T. Frohwein, J. W. Ballard, H. C. Porter. At the close of the meeting the graduating class sat down to a dinner tendered them by the Alumni, the festivities being prolonged until a late hour.

Pharmaceutical Society of Great Britain.—At the Pharmaceutical meeting held Nov. 6th, the President, Mr. John Williams, in the chair, a paper entitled *some bismuth residues* was read by Dr. E. A. Letts. The residues had been left on dissolving commercial bismuth in a mixture of 2 parts of nitric acid and 3 parts of water, and consisted in all probability of tellurides and selenides of the metals gold, silver and bismuth; neither sulphur nor other electro-negative constituent could be detected, and with the exception of traces of copper, no other metal. The tellurium amounted to between 12 and 20 per cent of the weight of the residue. The bismuth was of Australian origin, and had been refined probably by fusion with nitrate of potassium

Mr. Schacht stated that these residues amounted to about one-half per cent. of the metal, and that the bismuth preparations made from the metal seemed to contain a trace of tellurium. A girl of about six years had taken less than one grain of oxide of bismuth, which had made her breath smell of garlic for more than a week. Similar effects had been noticed before (see "Am. Jour Phar.," 1876, p. 133), and were attributed to the presence of tellurium. Professor Attfield suggested that since seleniuretted hydrogen was said to be much more pungent and powerful than tellurietted hydrogen, a minute quantity of selenium might cause all the mischief.

Tincture of quinine was the title of a paper read by Mr. W. Martindale, who

advocated its preparation from hydrochlorate instead of sulphate of quinia. The latter salt partly crystallizes from the tincture of orange peel, if but slightly deficient in alcohol, and sometimes a precipitate of sulphate of calcium is produced; both inconveniences are avoided with hydrochlorate of quinia, which however contains 82 per cent. of alkaloid against 74·5 per cent. in the sulphate.

Mr. J. C. Thresh read a paper on the *detection and approximate determination of minute quantities of alcohol* (see page 87).

Mr. E. M. Holmes read a paper, entitled *an adulteration of senega*. The drug had been sent to London from Brussels; the adulteration consisted of the rhizome and rootlets of Asclepias vincetoxicum, *Lin*, which about a year ago was reported by Charbonnier, of Caen, as having been met with as an adulteration of valerian, and which Professor Redwood observed had been received in London as white hellebore The vincetoxicum root consists of a horizontal rhizome about ¼ inch thick, and having a well defined pith in the centre of yellow wood; the roots are numerous, in tufts about an inch apart, smooth, scarcely furrowed and without a keel; it has a faint earthy odor and a slight taste and contains starch. Vincetoxicum resembles senega in color, but is readily distinguished from it by the characters given.

At the meeting held Dec. 4th, the deposit from tinture of quinia was again referred to. It was pointed out that for some years past the calisaya bark of commerce often contained scarcely any quinia; this Mr. Holmes believes to be due to the admixture of the bark of *Cinchona peruviana*

Prof. Bentley called attention to *spurious sumbul root*, which had been described by Pereira as Indian sumbul, but which is merely ammoniacum root flavored with musk, as was stated last year by Dr. Dymock. Prof. Bentley also referred to *gentian root* as derived from different species of Gentiana indigenous to Europe, which in many respects agree with the root of G. lutea.

Mr. Robbins and others made some remarks about *ethylate of sodium*, which was introduced some years ago by Dr. Richardson as a caustic (see p. 195).

Papers were read by Mr. J. Williams on *aceto-nitrate of iron* (see p. 93), and by Mr. E M. Holmes on *Baycuru root and guaycuru*. The latter is derived from *statice brasiliensis*, but the origin of baycuru root is still unknown. The root, bark and leaves of a Brazilian rosaceous shrub, *Chrysobalanus icaco*, is used as an astringent in chronic diarrhœa, leucorrhœa, etc., and a lotion to heal ulcers and wounds.

EDITORIAL DEPARTMENT.

Poisoning by Chlorate of Potassium.—We have frequently observed that articles originally contributed to this journal, on their way through several other cotemporaries failed to receive the proper credit as to origin, and occasionally came back to the United States as *new* information. The latest case in point is Mr. Kennedy's paper with the above caption, which was published on p. 112 of our last volume, and which is now being credited to the "Allg. Med. Central-Zeitung." It was copied into that journal from "Archiv der Pharmacie," where proper credit was given. We do not know into how many American medical journals it may have since found its way; but we have noticed it in the "Medical and Surgical Reporter" and in the Cincinnati "Lancet and Clinic," both of February 15th, 1879.

Iodide of Potassium.—The following communication explains itself:

In justice to American manufacturers, and especially those in the Western States, I deem it my duty to say that since the publication in the February number of the "Journal" (p. 76), of the article relating to the adulteration of iodide of potassium, I have discovered that the sample referred to is an imported drug, though at the time I supposed it was of Western manufacture from the manner in which the labels upon the bottle were printed.

C. E. DE PUY.

Chelsea, Mich., February 28th, 1879.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

Medicinal Plants; being descriptions, with original figures, of the principal plants employed in medicine, and an account of their properties and uses. By Robert Bentley, F.L.S., and Henry Trimen, M. B., F.L.S. Philadelphia: Lindsay & Blackiston. Price, per part, $2.00.

Parts 35 and 36, now before us, contain the handsome plates and the usual full descriptions of the following medicinal plants: Aspidium filix-mas, *Swartz*; Dichopsis (Isonandra) gutta, *Bentl.*; Erigeron canadense, *Lin.*; Foeniculum capillaceum, *Gilib*; Hibiscus exculentus, *Lin.*; Lactuca sativa, *Lin.*; Menyanthes trifoliata, *Lin.*; Metroxylon sagu, *Rottb.*; Morus nigra, *Lin*; Rheum rhaponticum, *Lin*; Rosa centifolia, *Lin.*; Salvia officinalis, *Lin.*; Triticum sativum, *Lin.*, and Vitis vinifera, *Lin.*

The National Dispensatory. By Professors Alfred Stillé and J. M. Maisch. Philadelphia: Henry C. Lea, 1879. 8vo, pp. 1628 Price, bound in muslin, $6.75; in leather, $7.50 Or bound in two parts, in muslin, $7.50; in leather, $8.50.

This work was issued March 1st, but we regret, in consequence of an oversight, the gentleman who has undertaken to review it for the JOURNAL failed to receive it in time for preparing a critical review for the present number; it has been promised for the May number.

OBITUARY.

F. L. M. DORVAULT died in Paris February 16th, in the 65th year of his age. After having passed the examination at the école supérieure de Pharmacie, he established himself in Paris, and in 1852 founded the Pharmacie Centrale, of which he was the Director until the time of his death. He had been a contributor to several medical and pharmaceutical journals, and in 1860 commenced the publication of a monthly journal, "l'Union Pharmaceutique." His most important work is "l'Officine," of which eight or nine editions have been published. The deceased was a corresponding member of the Philadelphia College of Pharmacy and the recipient of similar marks of esteem from numerous other scientific societies.

PROFESSOR DR. FRANZ SONNENSCHEIN died in Berlin February 26th, after severe illness, in his 60th year. He was born in Cologne, became a pharmacist and located in Berlin as instructor in chemistry. About eight years ago he was elected to a professorship. He was an authority in forensic chemistry and the author of several works on chemistry, the most important of which is one on the detection of poisons.

PROFESSOR GEORGE B. WOOD, M.D., died in Philadelphia March 30th at the age of 82 years. He was connected as professor with the Philadelphia College of Pharmacy from 1822 to 1835, occupying first the chair of chemistry, and afterwards that of Materia Medica. From 1835 to 1860 he was a member of the Faculty of the Medical Department of the University of Pennsylvania, laboring for fifteen years as Professor of Materia Medica and Pharmacy, and for ten years in the chair of Practice of Medicine. Dr. Wood was widely known as an author, chiefly of medical works; but the one through which he was best known among pharmacists is the United States Dispensatory, which was written in conjunction with Dr. Franklin Bache, and of which the first edition appeared in 1833. Through this work he has exerted a marked influence upon the elevation of pharmacy in the United States, in the history of which his name will always occupy one of the most prominent places.